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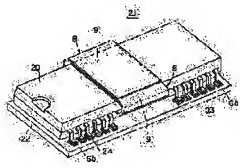
(54) SEMICONDUCTOR DEVICE, MANUFACTURE THEREOF, AND LEAD FRAME APPLIED THERETO



(57)Abstract:
PURPOSE: To obtain a semiconductor device small in size and large in heat dissipating capacity by a method wherein the outer sections of heat dissipating fins protruding from the side face of a resin-sealed package are bent and arranged so as to overlap each other in a top view.
CONSTITUTION: A tab 7 to which a semiconductor pellet 15 is bonded, leads 6 electrically connected to the semiconductor pellet 15, and heat dissipating fins 8 linked to the tab 7 are provided. A package 20 which seals up the tab 7, the pellet 15, and part of the leads 6 and the leads 6 with resin is provided. The outer parts 9 of the heat dissipating fins 8 extending from the side of the resin-sealed package 20 are bent and arranged so as to overlap each other in a top view above the resin-sealed package 20. By this setup, a semiconductor device of this design enhanced in heat dissipating area, small in size as a whole, and large in heat dissipating capacity can be obtained.

CLAIMS

[Claim(s)]
[Claim 1]A tab with which bonding of the semiconductor pellet is carried out, and two or more leads electrically connected to a semiconductor pellet, respectively, In a semiconductor device provided with two or more radiation fins connected with said tab, and a package which carries out the resin seal of a tab, a pellet, a part of each lead, and a part of each radiation fin, A semiconductor device arranging so that each outer part of two or more of said projected radiation fins may be crooked and it may lap mutually in plane view [above said resin seal package] from the side of said resin seal package.
[Claim 2]The semiconductor device according to claim 1, wherein a crevice is established between each outer part of a radiation fin arranged so that it may lap mutually in plane view [above said resin seal package].
[Claim 3]It is a leadframe provided with a tab, a lead of two or more currently allocated by approaching this tab, and two or more radiation fins connected with said tab in one, A process for which a leadframe provided with length formed so that said each radiation fin may project from a resin seal package after a resin seal, curvature forming of each of that projected outer part may be carried out further and it may lap mutually in plane view [above a resin seal package] is prepared, A process to which bonding of the semiconductor pellet is carried out on a tab of a leadframe prepared by said process, A process to which bonding of the both ends of a wire is carried out between an electrode pad of a semiconductor pellet in which bonding was carried out by said process, and an inner part of said lead of each, A process fabricated so that resin may be used and a resin seal package may carry out the resin seal of said tab, a semiconductor pellet, an inner part of a lead, some radiation fins, and the wire, A manufacturing method of a semiconductor device provided with a process fabricated so that each outer part of two or more radiation fins projected from a resin seal package may be crooked and may lap mutually in plane view [above said resin seal package].
[Claim 4]It is a leadframe provided with a tab, a lead of two or more currently allocated by approaching this tab, and two or more radiation fins connected with said tab in one, A leadframe provided with length formed so that said each radiation fin may project from a resin seal package after a resin seal, curvature forming of each of that projected outer part may be carried out further and it may lap mutually in plane view [above a resin seal package].

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention is used for the production technology of a semiconductor device, and the low-fever resistance type semiconductor device especially provided with the radiation fin, and relates to an effective thing.
[0002]
[Description of the Prior Art]As art which raises the heat dissipation nature of a semiconductor device provided with the surface mount form package, conventionally, Nikkei McGraw-Hill, Inc. issue "Nikkei micro device September, 1989 item" There is art of attaching a heat spreader and an external radiation fin within and without a resin seal package as a separate part as indicated without P91.
[0003]However, this art becomes expensive in order to attach a separate part.
[0004]Then, as a low-fever resistance type semiconductor device provided with the surface mount form package, for example as indicated to JP,S61-152051,A, Two or more radiation fins are formed in one tab in one, a part of this radiation fin is the semiconductor device projected in the exterior of the resin seal package, and while the lobe of said radiation fin is formed broadly, there are some by which curvature forming is carried out to the Galle wing shape.

[0005]
[Problem(s) to be Solved by the Invention]However, in the thing of the above-mentioned structure, if the miniaturization of the outside of a semiconductor device is attained, heat radiating ability is restricted and it can approve only to predetermined electric power correspondence.
[0006]The purpose of this invention is to aim at miniaturization of the outside of a semiconductor device, and improvement in low-fever resistance ratio.
[0007]The other purposes and the new feature will become clear from description and the accompanying drawing of this Description along [said] this invention.
[0008]
[Means for Solving the Problem]It will be as follows if an outline of a typical thing is explained among inventions indicated in an application concerned.
[0009]Namely, a tab with which bonding of the semiconductor pellet is carried out and two or more leads electrically connected to a semiconductor pellet, respectively, In a semiconductor device provided with two or more radiation fins connected with said tab, and a package which carries out the resin seal of a tab, a pellet, a part of each lead, and a part of each radiation fin, It is arranged so that each outer part of two or more of said projected radiation fins may be crooked and it may lap mutually in plane view [above said resin seal package] from the side of said resin seal package.
[0010]
[Function]According to the above mentioned means, even if the pellet which adhered on the tab generates heat, the heat is spread from a tab to a radiation fin, and radiates heat good to outer space from the outer part of the radiation fin arranged at the upper portion of a resin seal package. And since it is arranged so that the outer part of two or more radiation fins may lap mutually in plane view in the upper portion of a resin seal in this case, a heat sinking plane product is made to a big thing, and heat radiating ability can be enlarged. Since the outside dimension as the whole semiconductor device does not become large, it is small and the large semiconductor device of heat radiating ability can be obtained.
[0011]
[Example]The perspective view, drawing 2 - drawing 19 in which the mounted state of the low-fever resistance type semiconductor device whose drawing 1 is one working example of this invention is shown are each explanatory view explaining the manufacturing method.
[0012]In this example, the low-fever resistance type semiconductor device concerning this invention is constituted as a low-fever resistance type semiconductor integrated circuit device (henceforth low-fever resistance type SOP-IC) provided with the small outline package. While the tab 7 currently formed in the plate shape of an approximately rectangle and the inner part 6a approach the long side of both tabs 7, respectively and are radiately allocated in it, this low-fever resistance type SOP-IC21, The outer part 6b currently formed successively by each inner part 6a respectively in one is provided with the lead 6 of two or more which is projected in the side by the side of the shorter side of the tab 7, respectively, and is crooked in the Galle wing shape.
The radiation fins 8 and 8 of the couple currently formed in rectangular plate shape are arranged on both shorter sides by the tab 7, respectively, and are formed successively in one.

[0013]The radiation fin 8 is arranged so that the projecting end part may be located in the center section in the sequence of the outer part 6b of the lead 6, and it is projected to the method of outside, and the projecting end part of the radiation fin 8 constitutes the outer part 9 substantially. These outer parts 9 are provided with a little larger width than the shorter side of the tab 7, and length is provided with length a little longer than the long side of the tab 7. Curvature forming of the outer part 9 of these radiation fins 8 is carried out to the upper part and the method of water Hiranai, respectively, and it is arranged so that it may lap in plane view with a crevice [above the resin seal package 20] mutually.
[0014]It is allotted to the surface and rear surface of the radiation fin 8 so that the rugged surface part 10 may cross in the direction which intersects perpendicularly with a radiation fin in a coupling end with the tab 7, and it is formed in it by suitable means, such as a coining process (coining) or

etching processing.
[0015]The both-ends neighborhood of the radiation fin 8, the slits 11 and 11 of 1 set of couple are allotted to a coupling end with the tab 7, respectively, and are ****(ed) by rectangular shape in one. Only a suitable interval is estranged mutually, both the slits 11 and 11 are allocated in parallel, and the resin filling portion 11A is substantially constituted by filling up with molding resin of the resin seal package 20.
[0016]On the tab 7, bonding of the pellet 15 which had the integrated circuit made is carried out by the suitable means, and two or more electrode pads 16 are arranged on approximately annular, and are formed in the outer periphery part in the upper surface of the pellet 15. These electrode pads 16 are arranged the lead 6 group side edge neighborhood of the pellet 15, respectively.
Between the inner parts 6a of each lead 6, bonding of the wire 18 is carried out to these, and it is bridged.
Therefore, signal circuits in the integrated circuit of the pellet 15 are electrically pulled out outside via the pad 16, the wire 18, and the lead 6.
[0017]And this low-fever resistance type SOP-IC21 is provided with the resin seal package 20 by which resin was used and integral moulding was carried out to the flatbed shape of the approximately rectangle with the transfer molding method etc., The non-hermetic seal of said tab 7, the inner part 6a of the lead 6, some radiation fins 8, the pellet 15, and the wire 18 is carried out with this resin seal package 20. Namely, the outer part 6b group of the lead 6 is projected, respectively from the side by the side of both the long sides in the resin seal package 20, and, as for the radiation fin 8, the outer part 9 is projected to the center section of the outer part 6b array of the lead 6 in the side by the side of both the long sides of the resin seal package 20. And the outer part 6b of the lead 6 is crooked downward in the exterior of the resin seal package 20, Furthermore, are crooked in a level outside direction, and it is formed in the Galle wing shape and each outer part 9 of the radiation fin 8 of a couple is crooked upward in the exterior of the resin seal package 20, Furthermore, it is crooked in level inboard, and it is arranged so that it may lap in plane view with a crevice [above the resin seal package 20] mutually.
[0018]The manufacturing method of low-fever resistance type SOP-IC which starts hereafter said composition which is one working example of the manufacturing method of the semiconductor device concerning this invention is explained. Composition of said low-fever resistance type SOP-IC is further clarified by this explanation.
[0019]In the manufacturing method of low-fever resistance type SOP-IC concerning this example, the multiple-string leadframe 1 constituted as shown in drawing 2 is manufactured.
[0020]The sheet metal which consists of iron system materials, such as copper system (copper or its alloy) materials, such as phosphor bronze and oxygen free copper, or covar, 42 alloys, is used, and integral moulding of this multiple-string leadframe 1 is carried out by suitable means, such as punching press working of sheet metal or etching processing. Two or more unit leadframes 2 are installed in the transverse direction by one row side by side at this multiple-string leadframe 1. However, as for the multiple-string leadframe 1, only one unit is illustrated.
[0021]The unit leadframe 2 is provided with one pair of outer frame 3 by which the tooling holes 3a are established, and both the outer frames 3 and 3 are installed in a parallel series at the predetermined intervals, respectively. In each unit leadframe 2, among both outer frames 3 and 3, Tiber 4 of a couple is mutually parallel to the dam member 5 and the outside of a couple, and it is allotted so that it may become an outer frame and a right angle, and lifting and holding are carried out in one. The lead 6 of two or more is allotted to a longitudinal direction at equal intervals by the dam member 5, and it is mutually parallel to it, and it protrudes in one so that it may intersect perpendicularly with the dam member 5. By being allotted so that the long side of both tabs which carry out the postscript of the tip may be approached, respectively and this may be surrounded, the inner end of each lead 6 constitutes the inner part 6a, respectively. On the other hand, the tip is connected to Tiber 4 in one, and the outside extension of each lead 6 constitutes the outer part 6b, respectively. And the portion during the adjacent lead 6 and 6 in the dam member 5 constitutes substantially the dam 5a which dams up the flow of resin at the time of package shaping mentioned

later.
[0022]The radiation fins 8 and 8 of a couple are arranged on both dam members 5 and 5 in the center section of the length direction, and it protrudes respectively in one so that it may intersect perpendicularly with the dam members 5 and 5. Between the inner ends of both the radiation fins 8 and 8, the tab 7 formed in the plate shape of an approximately rectangle is connected in one, and lifting and holding are carried out. On the other hand, as for the outside extension of both the radiation fins 8 and 8, the tip has extended outside Tiber 4.
This portion constitutes the outer part 9 substantially, respectively.

[0023]The rugged surface part 10 is allotted to the surface and rear surface of both the radiation fins 8 and 8, respectively so that it may cross in the direction which intersects perpendicularly with a radiation fin in the end of tab slippage to the dam member 5, and it is formed in it by suitable means, such as a coining process (coining) or etching processing.
[0024]The slit 11 of 1 set of couple is allotted to the end of tab slippage by the both-ends neighborhood of both the radiation fins 8 and 8 to the dam member 5, respectively, and is established in one. Only a suitable interval is estranged mutually, and both the slits 11 and 11 are allocated in parallel, and are formed in the rectangular shape of the size with which resin is certainly filled up in the forming cycle of the resin seal package mentioned later, respectively. That is, the resin filling portion 11A is substantially constituted by this slit 11.
[0025]The tab 7 is being moved back in the pellet thickness part grade and the direction of a rear face which carry out a postscript rather than the field of lead 6 group (what is called tab lowering).
[0026]Next, pellet bonding work, then wire bonding work will be done for every unit leadframe by the multiple-string leadframe constituted as mentioned above, and an assembly as shown in drawing 3 will be manufactured by these work. By carrying out pitch feed of the multiple-string leadframe to a transverse direction, these bonding work is done one by one for every unit leadframe.
[0027]First, the pellet 15 as a semiconductor integrated circuit element which had the integrated circuit (not shown) of a bipolar form made by pellet bonding work in what is called a previous process in the manufacturing process of a semiconductor device, It is allotted to the approximately center part on the tab 7 in each unit leadframe 2, and suitable bonding agents, such as silver paste, adhere via the bonding layer 14 formed by the pellet bonding apparatus (not shown) used.
[0028]Between the electrode pad 16 of the pellet 15 by which bonding was carried out to the tab 7, and the inner part 6a of each lead 6 in each unit leadframe 2, and a copper system, a golden system, Or by using a wire bonding apparatus [like an ultrasonic thermocompression bonding method] (not shown) whose wire 18 which the material of an aluminum system is used and is formed is, bonding is carried out, respectively and the both ends are bridged.
[0029]That is, two or more electrode pads 16 are arranged and formed in the outer periphery part in the upper surface of the pellet 15. These electrode pads 16 are arranged the lead group side edge neighborhood of the pellet 15, respectively.
Bonding of these electrode pads 16 is carried out between the inner parts 6a of each lead 6, and the wire 18 is bridged between.
Therefore, signal circuits in the integrated circuit of the pellet 15 will be electrically pulled out outside via the electrode pad 16, the wire 18, and the lead 6.
[0030]Thus, the package group which carries out a resin seal for every unit leadframe has a transfer molding device as shown in drawing 4 used by a pellet and the multiple-string leadframe by which wire bonding was carried out, and simultaneous shaping is carried out about a unit leadframe group at it.
[0031]The transfer molding device shown in drawing 4 is provided with the punch 31 and the bottom part 32 of a couple by which it is mold clamp carried out mutually with the cylinder device (not shown) etc., and to the mating face of the punch 31 and the bottom part 32 The punch cavity crevice 33a, The group recession is carried out by more than one, respectively so that the bottom part cavity crevice 33b may collaborate mutually and may form the cavity 33. When the multiple-string leadframe 1 concerning said composition is used and transfer moulding of the resin seal form

package is carried out, each cavity 33 in the punch 31 and the bottom part 32 corresponds to the space between the dam members 5 and 5 of the couple in each unit leadframe 2, respectively.
[0032]The pot 34 is established by the mating face of the punch 31, and it is inserted in the pot 34 so that the plunger 35 which moves with a cylinder device (not shown) can feed resin (henceforth resin) as a molding material. While the cull 36 is allotted and recessed by the opposed position with the pot 34 at the mating face of the bottom part 32, it is allotted radiately and recessed so that the runner 37 of two or more sections may connect with the pot 34, respectively. The other end of each runner 37 is connected to the bottom cavity crevice 33b, respectively, and it is formed in the terminal area so that the gate 38 may pour in resin into the cavity 33. a rectangle a little larger so that it may escape to the mating face of the bottom part 32 and the hollow 39 can escape the thickness of a leadframe than the outside of the multiple-string leadframe 1 -- the thickness and abbreviation -- it is recessed by the constant depth of the equal size.
[0033]Next, the forming process of a resin seal package is explained about the case where the transfer molding device concerning said composition is used.
[0034]At the time of transfer moulding, in the escape hollow 39 recessed by the bottom part 32, it is allotted and the multiple-string leadframe 1 concerning said composition is set so that the pellet 15 in each unit leadframe 2 may be accommodated in each cavity 33, respectively. Then, it is mold clamp carried out of the punch 31 and the bottom part 32, and from the pot 34, the resin 40 is fed into each cavity 33 through the runner 37 and the gate 38 by the plunger 35, and it is pressed fit.
[0035]If resin heat-hardens after pouring and the resin seal package 20 is fabricated, while the mold opening of the punch 31 and the bottom part 32 will be carried out, resin seal package 20 group is released from mold with an ejector pin (not shown).
[0036]Thus, discharging of the multiple-string leadframe 1 which had package 20 group fabricated is carried out from the transfer molding device 30 as shown in drawing 5 and drawing 6. And the resin seal of the inner part 6a and the wire 18 of some of tabs 7, radiation fins 8, the pellet 15, and the lead 6 will be carried out to the inside of the package 20 resin-molded in this way. In this state, the resin filling portion 11A is substantially formed by filling up with resin in each slit 11.
[0037]After the multiple-string leadframe which had the resin seal package fabricated as mentioned above passes through plating down stream processing, With or the lead and radiation-fin cutting device which are shown in drawing 8 one by one for every unit leadframe in the lead and the radiation-fin cutting forming cycle as shown in drawing 7 before passing. After the outer frame 3, Tiber 4, and the dam 5a are separated, with the lead forming apparatus shown in drawing 9. Curvature forming of the outer part 9 of the radiation fin 8 is carried out to specified shape by the radiation-fin molding equipment which curvature forming of the outer part 6b of the lead 6 is carried out to the Galle wing shape, and is shown in drawing 11 and drawing 12.
[0038]Next, drawing 7 - drawing 12 are made reference, and a lead and a radiation-fin cutting forming cycle are explained.
[0039]The lead and the radiation-fin cutting molding equipment 50 which are used by this lead and a radiation-fin cutting forming cycle are provided with the feeder 51 as shown in drawing 7. The feeder 51 is constituted so that stepping delivery of the multiple-string leadframe 1 as a work may be carried out to one way with the pitch corresponding to the unit leadframe 2 with an intermittent feed device (not shown).
the multiple-string leadframe 1 by which the loader 52 is furnished to the end part (it is hereafter considered as a front end part.) of the feeder 51, and the loader 52 was accommodated in the rack etc. -- the feeder 51 top -- addressing ******* to one sheet -- it is constituted like. The lead and the radiation-fin cutting device 53 are furnished to the pars intermedia of the feeder 51, and this device is constituted as shown in drawing 8.
[0040]The lead forming apparatus 54 constituted as shown in drawing 9, and the radiation-fin molding equipment 100 constituted as shown in drawing 10 - drawing 11 are arranged and furnished to the side of the lead in the feeder 51, and the radiation-fin cutting device 53.
Between a lead and the radiation-fin cutting device 53, and the lead forming apparatus 54, the hair drier 55. It is furnished so that IC part 57 as an intermediate product separated from the outer frame

of the multiple-string leadframe 1 in the lead and the radiation-fin cutting device 53 may be held and it can transfer to the lead forming apparatus 54.
The feeder 101 is allocated between the lead forming apparatus 54 and the radiation-fin molding equipment 100.
[0041]The unloader 56 is furnished to the rear end part of the feeder 51. This unloader 56 is constituted so that the frame (frame) part 58 as residue parts of the multiple-string leadframe 1 from which IC part 57 was clipped in the lead and the radiation-fin cutting device 53 may be given one by one and may be discharged from the feeder 51.
[0042]The lead and the radiation-fin cutting device 53 which are shown in drawing 8 are provided with the upper part tie-down plate 60 and the bottom tie-down plate 70, and the upper part tie-down plate 60 by moving up and down with a cylinder device (not shown), It is constituted so that it may approach and desert to the bottom tie-down plate 70 fixed on the machine stool. The holders 61 and 71 are attached to both the tie-down plates 60 and 70 fixed, respectively, and the alignment of upper part presser-foot type 62 and bottom presser-foot type 72 (it may be hereafter called the punch 62 and the bottom part 72.) is mutually carried out to both the holders 61 and 71, and it is held, respectively. The punch 62 and the bottom part 72 are formed in the abbreviated channel die steel shape which will be in the state of inside doubling also mutually, respectively, and the punch 62 and the bottom part 72 by the rear parts 63 and 73 on either side. It is constituted so that the root part in the outer part 6b of the lead 6 and the outer part 9 of the radiation fin 8 may be pressed down from the upper and lower sides. Like the frame presser foot which carries out a postscript, the punch 62 is constituted so that independent suspension may be carried out by the guide 68 and the spring 69.
[0043]To the upper part holder 61, the punch 64 formed in approximately sinking comb shape (not shown) A couple, It is allotted so that it may correspond to the pitch of lead 6 group, and the width of the outer part 9 of the radiation fin 8 in right-and-left both the sides of the punch 62, It is fixed downward [vertical], and it is constituted so that the shearing edge 66 may be arranged on the edge in a sinking comb by the punch 64, it may collaborate with the shearing die which carries out a postscript in it and the outer frame 3, Tiber 4, and the dam 5a may be cut off. The frame presser foot 67 fits into the guide 68 slidably, and is supported by the upper part holder 61, enabling free up-and-down motion, and the frame presser foot 67 is constituted so that independent suspension may be carried out in the state where it was always caudad energized by the spring 69. With this spring 69, the frame presser foot 67 compresses the outer frame 3 of a leadframe, and Tiber 4 between the shearing die upper surfaces which carry out a postscript, and is pressed down.
[0044]On the other hand, the shearing die 76 of a couple is arranged on the bottom part 72 by right-and-left both the sides of the rear part 73, and it is formed in the shape along the undersurface of lead shape, and the shearing die 76 is formed so that it may collaborate with the shearing edge 66 of said punch 64 and the outer frame 3, Tiber 4, and the dam 5a may be cut off.
[0045]The lead forming apparatus 54 shown in drawing 9 is provided with the upper part tie-down plate 80 and the bottom tie-down plate 90, and by moving up and down with a cylinder device (not shown), the upper part tie-down plate 80 is constituted so that it may approach and desert to the bottom tie-down plate 90 fixed on the machine stool. The holders 81 and 91 are attached to both the tie-down plates 80 and 90 fixed, respectively, and the alignment of upper part presser-foot type 82 and bottom presser-foot type 92 (it may be hereafter called the punch 82 and the bottom part 92.) is mutually carried out to both the holders 81 and 91, and it is held, respectively. The punch 82 and the bottom part 92 are formed in the abbreviated channel die steel shape which will be in the state of inside doubling also mutually, respectively, and the punch 82 and the bottom part 92 by the rear parts 83a and 83b on either side, and 93a and 93b. It is constituted so that the root part in the outer part 6b of the lead 6 may be pressed down from the upper and lower sides. The punch 82 is constituted so that independent suspension may be carried out by the guide 88 and the spring 89.
[0046]It is allotted to the upper part holder 81 so that the forming punch 84 may correspond to the width of the pitch of lead 6 group in a couple and right-and-left both the sides of the punch 82, It is fixed downward [vertical], and this punch 84 is constituted so that it may collaborate with the forming die which carries out a postscript and curvature forming of the outer part 6b of the lead 6

can be carried out to the Galle wing shape. The curved surface shape part 85 is formed in the inner shoulder which ****s to the outer part 6b of the punch 84 with suitable curvature.
[0047]On the other hand, the forming die 94 of a couple is allotted to right-and-left both the sides of the rear part 93 by the bottom part 92, and is formed in it at the shape which imitates the Galle wing shape of the outer part 6b of each lead 6 after shaping, respectively.
[0048]The alignment of upper part presser-foot type 110 and the bottom presser-foot type 120 which are fixed on the machine stool is carried out mutually, and the radiation-fin molding equipment 100 shown in drawing 11 and drawing 12 is allocated. With upper part presser-foot type 110 and bottom presser-foot type 120, the rear parts 110a and 110b on either side, Although it is constituted so that the root part in the outer part 9 of the radiation fin 8 may be pressed down from the upper and lower sides by 120a and 120b, and upper part presser-foot type 110 is not illustrated, it is constituted like the lead forming apparatus shown in drawing 9 so that up-and-down motion is possible.
[0049]The bottom presser-foot boards 121 and 122 are formed in the both sides of bottom presser-foot type 120, respectively so that up-and-down motion is possible, as shown in drawing 11.
On both sides of upper part presser-foot type 110, further, outside, said bottom presser-foot boards 121 and 122 are formed so that up-and-down motion of the rolls 111 and 112 is possible respectively.
By moving to a sliding direction, these rolls 111 and 112 are constituted so that curvature forming of the outer part 9 of the radiation fin 8 can be carried out right-angled on the basis of the bottom presser-foot boards 121 and 122.
[0050]Rolls 113 and 114 with the another rolls 111 and 112 of said couple are formed in the both sides of upper part presser-foot type 110 so that up-and-down motion is possible, as shown in drawing 12. These rolls 113 and 114 comprise moving to a sliding direction so that curvature forming of the outer part 9 of the radiation fin 8 by which curvature forming was carried out can be carried out still more nearly right-angled with the rolls 111 and 112 of said couple upper part presser-foot type 110 and on the basis of the rear part of bottom presser-foot type 120. The window holes 123 and 124 are formed in both sides of the side which the outer part 9 of the radiation fin 8 arranges, respectively so that the curvature forming part of the outer part 9 of the radiation fin 8 can be inserted in bottom presser-foot type 120.
It has the space 125 inside so that said curvature forming part can furthermore be arranged.

[0051]Next, the operation about the lead concerning said composition and radiation-fin cutting molding equipment is explained.
[0052]As mentioned above, the multiple-string leadframe 1 which solder plating processing was carried out or is not processed is accommodated in addressing to two or more sheets, a rack, etc., and is supplied to the loader 52 of a lead and the radiation-fin cutting molding equipment 50. The multiple-string leadframe 1 fed by the loader 52 is paid out of a rack etc. one by one on addressing to one sheet, and the feeder 51 with the loader 52, and goes. Addressing stepping delivery to 1 pitch of the multiple-string leadframe 1 paid out to the feeder 51 is carried out with the interval between the unit leadframes 2 and 2 by the feeder 51.
[0053]And the unit leadframe 2 is supplied one by one to the multiple-string leadframe 1 by which stepping delivery is carried out in the feeder 51 top by a lead and the radiation-fin cutting device 53, and it goes.
[0054]Here, the operation about a lead and a radiation-fin cutting device is explained.
[0055]As the unit leadframe 2 drops the package 20 into the bottom part 72, it is set to a crevice by stepping delivery about the multiple-string leadframe 1, as shown in drawing 8. Thereby, the lead 6 and the Nemoto part in the outer parts 6b and 9 of the radiation fin 8 contact the rear part 73 of the bottom part 72.
[0056]Next, if the upper part tie-down plate 60 descends with a cylinder device, the punch 62 and the frame presser foot 67 will double with the bottom part 72 according to the energizing force of the spring 69. Thereby, the lead 6 and the Nemoto part in the outer parts 6b and 9 of the radiation

fin 8 are compressed and fixed between the rear part 63 of the punch 62, and the rear part 73 of the bottom part 72. The outer frame 3 and Tiber 4 are compressed and fixed between the frame presser foot 67 and the shearing die 76 upper surface.

[0057]Then, if the upper part tie-down plate 60 descends further and goes, the punch 64 will descend and it will go. Since the compression set of the spring 89 is carried out at this time as for the punch 62 and the frame presser foot 67, it is pressed by the bottom part 72 and the shearing die 76. The outer frame 3, Tiber 4, and the dam 5a are separated from the lead 6 and the radiation fin 8 with descent of the punch 64 by shearing by collaboration with the shearing edge 66 of the punch 64, and the shearing die 76.

[0058]After the punch 64 ends a predetermined stroke, the punch 64 goes up with the upper part tie-down plate 60, and is returned to the original waiting state.

[0059]In a lead and the radiation-fin cutting device 53, if cutting is completed and the upper part tie-down plate 60 goes up, IC part 57 which is the intermediate product cut off from the outer frame 3 of the multiple-string leadframe 1 will be transferred from on the bottom part 72 by the hair drier 55 to up to the bottom part 92 in the lead forming apparatus 54.

[0060]If IC part 57 is transferred to the lead forming apparatus 54, stepping delivery of the multiple-string leadframe 1 will be carried out by 1 pitch of the unit leadframe 2 by the feeder 51, and cutting described above about the unit leadframe 2 of the next step will be carried out.

[0061]Henceforth, cutting mentioned above about each unit leadframe 2 is repeated, and the multiple-string leadframe 1 goes.

[0062]And the frame (frame) part 58 as residue of the multiple-string leadframe 1 which cutting about all the unit leadframes 2 ended is taken down from on the feeder 51 in the unloader 56, and are collected at a predetermined place.

[0063]IC part 57 supplied to the lead forming apparatus 54 has lead-forming work done by this lead forming apparatus on the other hand.

[0064]Subsequently, the operation about the lead forming apparatus 54 is explained.

[0065]IC part 57 has the package 20 dropped into a crevice by the bottom part 92, and it is made and set as shown in drawing 9. Thereby, the root part in the outer part 6b of the lead 6 contacts the rear parts 93b and 93a of the bottom part 92, respectively.

[0066]Next, the upper part tie-down plate 80 descends with a cylinder device, and the punch 82 doubles with the bottom part 92 according to the energizing force of the spring 89. Thereby, in between the rear parts 83a and 83b of the punch 82, and the rear parts 93a and 93b of the bottom part 92, the root part in the outer part 6b of the lead 6 as a flection is compressed, respectively, and is fixed.

[0067]Then, if the upper part tie-down plate 80 descends further and goes, the punch 84 will descend and it will go. Since the compression set of the spring 89 is carried out at this time as for the punch 82, it is pressed by the bottom part 82.

[0068]If the punch 84 descends to the forming die 94, by being pushed against the forming die 94 with descent of the punch 84, the lead 6 will be crooked so that this forming die 94 may be imitated, and will be fabricated by the desired Galle wing shape. Thus, the outer part 6b of the lead 6 formed in the Galle wing shape projects caudad very more slightly [the undersurface (side principal surface with a field)] than the package 20 undersurface.

[0069]After the punch 84 ends a predetermined stroke, the punch 84 goes up and is returned to the original waiting state.Then, fabricated IC part 130 (refer to drawing 10) is removed from the bottom part 92, with the feeder 101, is fed by the radiation-fin molding equipment 100 with which a next process is carried out, and goes.

[0070]As for IC part 130 sent to the radiation-fin molding equipment 100 by the feeder 101, curvature forming of the outer part 9 of the radiation fin 8 is carried out here. Hereafter, the operation about the radiation-fin molding equipment 100 is explained.

[0071]IC part 130 as an intermediate product in which curvature forming of the outer part 6b of the lead 6 was carried out to the Galle wing shape at the aforementioned process is set to bottom presser-foot type 120 as shown in drawing 11. Thereby, the root part in the outer part 9 of the

radiation fin 8 contacts the rear parts 120a and 120b of the right and left of bottom presser-foot type 120, respectively.
[0072]Next, upper part presser-foot type 110 descends, and between the rear parts 110a and 110b of upper part presser-foot type 110, and the rear parts 120a and 120b of bottom presser-foot type 120, the root part in the outer part 9 of the radiation fin 8 as a flection is compressed, respectively, and is fixed.
[0073]Then, the rolls 111 and 112 of a couple descend and it goes. Descent of both the rolls 111 and 112 will carry out curvature forming of the outer part 9 of the radiation fin 8 with the rolls 111 and 112 right-angled caudad considering the bottom presser-foot boards 121 and 122 arranged inside the rolls 111 and 112 as a reference point.
[0074]Under the present circumstances, the position from the root part of the outer part 9 of the radiation fin 8 in the bottom presser-foot boards 121 and 122 on either side, Since the direction of the bottom presser-foot board [on the other hand / (left-hand side)] 121 is arranged in the distance position more distant than the bottom presser-foot board 122 of another side (right-hand side), difference of the position bent of each outer part 9 in the radiation fin 8 on either side is carried out. The outer part 9 of the radiation fin [on the other hand / (left-hand side)] 8 is crooked in the position further than the outer part 9 of the radiation fin 8 of another side (right-hand side) from a root part.

[0075]After curvature forming with both the rolls 111 and 112 finishes, the rolls 111 and 112 on either side move to an upper prescribed position, and the bottom presser-foot boards 121 and 122 on either side stand by till the curvature forming of the following IC part while moving to a downward prescribed position.
[0076]Then, the rolls 113 and 114 of couple with said another rolls 111 and 112 descend, and it goes as shown in drawing 12. Descent of these rolls 113 and 114 will carry out curvature forming of the outer part 9 of the radiation fin 8 with the rolls 113 and 114 right-angled caudad considering the rear part of upper part presser-foot type 110 and bottom presser-foot type 120 as a reference point.
[0077]by the above, the outer part 9 of the radiation fin 8 of a couple is crooked from a root part, respectively -- each curvature forming part -- the upper surface (in drawing 12, it arranges to the down side) of the resin seal package 20 of IC part 130 -- a wrap -- it is arranged so that it may be made like, a crevice may be opened mutually and it may lap in plane view.
[0078]It means that low-fever resistance type SOP-IC21 which starts said composition as mentioned above was manufactured.
[0079]In the printed-circuit board 22, low-fever resistance type SOP-IC21 concerning said composition is used, carrying out a surface mount as shown in drawing 1 and drawing 13.
[0080]That is, the land 23 is allotted to two rows so that more than one may correspond on the printed-circuit board 22 in the outer part 6b group of the lead 6 of low-fever resistance type SOP-IC21, it has solder material etc. used, and is formed in the Kodaira plate shape of an approximately rectangle.
[0081]When the surface mount of low-fever resistance type SOP-IC21 is carried out to this printed-circuit board 22, the outer part 6b group of the lead 6 of this SOP-IC21 has cream solder material (not shown) sandwiched by the land 23 on the printed-circuit board 22, and is contacted, respectively. Then, since the soldering part 25 will be formed between the outer part 6b group of a lead, and the land 23 by suitable means, such as reflow solder processing, if solidified after melting of the cream solder material is carried out, It is connected to the printed-circuit board 22 electrically and mechanically, and a surface mount will be carried out by low-fever resistance type SOP-IC21.
[0082]Since bonding of the pellet 15 is directly carried out to the tab 7 which was united in the radiation fin 8 if the pellet 15 generates heat during operation in said mounted state, heat will be directly spread to the radiation fin 8, and will radiate heat effectively through the radiation fin 8.
[0083]Here, the heat spread to the radiation fin 8 radiates heat from the pellet 15 to outer space through the outer part 9 of the radiation fin 8. And since the crevice is established between the outer parts 9 and 9 of the upper and lower sides arranged so that it may lap [further / heat dissipation

nature is good and / above the resin seal package 20] mutually in plane view, since the heat sinking plane product of the outer part 9 of the radiation fin 8 is large, By carrying out air cooling of the outer part 9 of the upper portion of the resin seal package 20, heat dissipation nature improves further.

[0084]Since the interface of the radiation fin 8 and the resin seal package 20 becomes large when the radiation fin 8 projects in the exterior of the resin seal package 20 with a large opening on the other hand, the permeation possibility of the moisture from the interface increases, and it is possible that moisture resistance falls.

[0085]However, in this example, since it is formed so that the rugged surface part 10 may cross the radiation fin 8 in the inside of the resin seal package 20 to the radiation fin 8, a damp-proof fall will be controlled effectively. That is, it is because the leak path to the pellet 15 in the radiation fin 8 becomes long by the rugged surface part 10.

[0086]According to said working example, the following effect is acquired.

** Since a heat sinking plane product can be enlarged by being arranged so that each outer part of two or more projected radiation fins may be crooked and it may lap mutually in plane view [above a resin seal package] from the side of the resin seal package of a semiconductor device, heat dissipation nature can be made good.

[0087]** Since air cooling of the outer part is carried out by establishing the crevice between the outer parts arranged so that it may lap mutually in plane view [above the above-mentioned resin seal package], heat dissipation nature is further made to fitness.

[0088]** By the aforementioned **, it is low-fever resistance type and, moreover, the small semiconductor device of an outside can be obtained.

[0089]** In the aforementioned **, since a radiation fin is formed in a tab at one and a separate part is not attached, it can manufacture cheaply.

[0090]Drawing 14 and drawing 15 are what shows low-fever resistance type IC provided with the quad flat and the resin seal package (QFP) which is working example 2 of this invention, Drawing 14 is a top view of IC part 130A before curvature forming of the radiation fin is carried out, and drawing 15 is a front view showing QFP-IC 21A which curvature forming of the outer part 9A of the radiation fin 8A in the IC part 130A was carried out, and was formed.

[0091]in this example 2, from four sides of the resin seal package 20, two or more outer parts 6b of a lead project, and are carried out, and the outer part 9A of the four radiation fins 8A is projected and made into the diagonal direction from four corners of the resin seal package 20, respectively. Each radiation fins 8A are formed successively by four corners of the tab 7 in one, and the outer part 9A of each radiation fin 8A is provided with the square part 191 which makes the same size as the resin seal package 20 at the tip of the long and slender straight part 190. These square parts 191 are formed so that the resin seal package 20 and symmetrical shape may be made to the straight line which makes the straight part 190 and a right angle.

[0092]And curvature forming of the outer part 9A of each radiation fin 8A is carried out so that it may lap in plane view with a crevice in the upper portion of the resin seal package 20 mutually, respectively. Therefore, even if the pellet which adhered on the tab 7 during operation in the mounted state generates heat, that heat is spread by this QFP-IC 21A from the tab 7 to the radiation fin 8A, and it radiates heat good to outer space from the outer part 9A of the radiation fin 8A arranged to the upper portion of the resin seal package 20.

[0093]As for QFP-IC 21A concerning this example 2, [above the resin seal package 20], like said working example 1, since outer one 9A of the four radiation fins 8A laps mutually and is arranged by plane view, a heat sinking plane product becomes very large, therefore heat radiating ability becomes very large.

[0094]Since the crevice is formed between the outer parts 9A arranged so that it may lap mutually in plane view [above the resin seal package 20], air cooling of the radiator will be carried out and heat dissipation nature improves further.

[0095]Since it arranges so that the square part 191 of a form of the outer part 9A of the radiation fin 8A arranged above the resin seal package 20 may correspond in the resin seal package 20 and plane

view, small outside-ization can be attained.
[0096]Drawing 16 and drawing 17 are what shows SOP-IC which is working example 3 of this invention. The top view and drawing 17 (a) and (b) which drawing 16 shows IC part 130B before curvature forming of the radiation fin is carried out are the front view and side view showing SOP-IC 21B which curvature forming of outer one 9B of the radiation fin 8B in the IC part 130B was carried out, and was formed.
[0097]in this example, from the both side surfaces which make the long side of the resin seal package 20 which makes rectangular form, two or more outer parts 6b of a lead project, and are carried out, and the outer part 9B of the radiation fin 8B is projected and made into the longitudinal direction, respectively from the both side surfaces which make the shorter side of the resin seal package 20. Each radiation fins 8B are formed successively by the tab 7 respectively in one, and the outer part 9B of each radiation fin 8B is provided with the rectangle part 193 which makes the same size as the resin seal package 20 following the narrow part 192. These rectangle parts 193 are formed so that the resin seal package 20 and symmetry may be made to the straight line of the short side direction of the resin seal package 20.
[0098]And curvature forming of the outer part 9B of each radiation fin 8B is carried out so that it may lap in plane view with a crevice in the upper portion of the resin seal package 20 mutually, respectively. Therefore, even if the pellet which adhered on the tab 7 during operation in the mounted state also about this SOP-IC 21B generates heat, The heat is spread from the tab 7 to the radiation fin 8B, and radiates heat good to outer space from the outer part 9B of the radiation fin 8B arranged to the upper portion of the resin seal package 20. This SOP-IC 21B will also demonstrate the same effect as above-mentioned QFP-IC 21A.
[0099]Drawing 18 and drawing 19 are what shows QFP-IC which is working example 4 of this invention, They are a top view in which drawing 18 shows IC part 130C before curvature forming of the radiation fin is carried out, and a front view in which the outer part 9C of the radiation fin [in / in drawing 19 / the IC part 130C] 8C shows QFP-IC 21C which curvature forming was carried out and was formed.
[0100]In this example 4, from four sides of the resin seal package 20, the outer part 6b of the lead has projected two or more, and formed protruding of the radiation fin 8C is further carried out from four sides of the resin seal package 20, respectively. The four radiation fins 8C are formed successively by four corners of the tab 7 respectively in one. The straight parts 194 and 195 of the couple which has projected the outer part 9C of the radiation fin 8C outside the outer part 6b of a lead in parallel with outer one 6b of a lead in the both-sides position of the outer part 6b of a lead of two or more in the one side face of the resin seal package 20, It comprises the rectangle part 196 connected between the tip parts of these straight parts, and it is provided so that it may surround outer one 6b of a lead of two or more in the straight parts 194 and 195 and the rectangle part 196.
[0101]And in the side of the resin seal package 20, after it is crooked up, the outer part 9C of each radiation fin 8C is crooked in level inboard, and it is side view, and curvature forming is further carried out, respectively so that approximately KO type shape may be made. The upper bed side of the outer part 9C of these radiation fins 8C makes the upper surface and the same height position of the resin seal package 20, or is arranged at the position lower than the upper surface of the resin seal package 20. Therefore, since the overall height of QFP-IC does not become high, it is suitable when it desires a thin type.
[0102]Although the invention made by this invention person above was concretely explained based on working example, it cannot be overemphasized that it can change variously in the range which this invention is not limited to said working example, and does not deviate from the gist.
[0103]For example, although the above explanation explained the case where the invention mainly made by this invention person was applied to low-fever resistance type SOP-IC and QFP-IC used as the background which are fields of the invention, It is applicable to not the thing limited to it but low-fever resistance type SOJ-IC provided with small outline, J RIRIDDO, and a resin seal package, QFJ (PLCC), IC, etc.
[0104]

[Effect of the Invention]It will be as follows if the effect acquired by the typical thing among the inventions indicated in an application concerned is explained briefly.
[0105]Since a heat sinking plane product can be enlarged by being arranged so that each outer part of two or more projected radiation fins may be crooked and it may lap mutually in plane view [above a resin seal package] from the side of a resin seal package, It is small and the large semiconductor device of heat radiating ability can be obtained.

[Translation done.]

TECHNICAL FIELD

[Industrial Application]This invention is used for the production technology of a semiconductor device, and the low-fever resistance type semiconductor device especially provided with the radiation fin, and relates to an effective thing.
[0002]

PRIOR ART

[Description of the Prior Art]As art which raises the heat dissipation nature of a semiconductor device provided with the surface mount form package, conventionally, Nikkei McGraw-Hill, Inc. issue "Nikkei micro device September, 1989 item" There is art of attaching a heat spreader and an external radiation fin within and without a resin seal package as a separate part as indicated without P91.
[0003]However, this art becomes expensive in order to attach a separate part.
[0004]Then, as a low-fever resistance type semiconductor device provided with the surface mount form package, for example as indicated to JP,S61-152051,A, Two or more radiation fins are formed in one tab in one, a part of this radiation fin is the semiconductor device projected in the exterior of the resin seal package, and while the lobe of said radiation fin is formed broadly, there are some by which curvature forming is carried out to the Galle wing shape.

EFFECT OF THE INVENTION

[Effect of the Invention]It will be as follows if the effect acquired by the typical thing among the inventions indicated in an application concerned is explained briefly.
[0105]Since a heat sinking plane product can be enlarged by being arranged so that each outer part of two or more projected radiation fins may be crooked and it may lap mutually in plane view [above a resin seal package] from the side of a resin seal package, It is small and the large semiconductor device of heat radiating ability can be obtained.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the thing of the above-mentioned structure, if the miniaturization of the outside of a semiconductor device is attained, heat radiating ability is restricted and it can approve only to predetermined electric power correspondence.
[0006]The purpose of this invention is to aim at miniaturization of the outside of a semiconductor device, and improvement in low-fever resistance ratio.
[0007]The other purposes and the new feature will become clear from description and the accompanying drawing of this Description along [said] this invention.

MEANS

[Means for Solving the Problem]It will be as follows if an outline of a typical thing is explained among inventions indicated in an application concerned.
[0009]Namely, a tab with which bonding of the semiconductor pellet is carried out and two or more leads electrically connected to a semiconductor pellet, respectively, In a semiconductor device provided with two or more radiation fins connected with said tab, and a package which carries out the resin seal of a tab, a pellet, a part of each lead, and a part of each radiation fin, It is arranged so that each outer part of two or more of said projected radiation fins may be crooked and it may lap mutually in plane view [above said resin seal package] from the side of said resin seal package.

OPERATION

[Function]According to the above mentioned means, even if the pellet which adhered on the tab generates heat, the heat is spread from a tab to a radiation fin, and radiates heat good to outer space from the outer part of the radiation fin arranged at the upper portion of a resin seal package. And since it is arranged so that the outer part of two or more radiation fins may lap mutually in plane view in the upper portion of a resin seal in this case, a heat sinking plane product is made to a big thing, and heat radiating ability can be enlarged. Since the outside dimension as the whole semiconductor device does not become large, it is small and the large semiconductor device of heat radiating ability can be obtained.

EXAMPLE

[Example]The perspective view, drawing 2 - drawing 19 in which the mounted state of the low-fever resistance type semiconductor device whose drawing 1 is one working example of this invention is shown are each explanatory view explaining the manufacturing method.
[0012]In this example, the low-fever resistance type semiconductor device concerning this invention is constituted as a low-fever resistance type semiconductor integrated circuit device (henceforth low-fever resistance type SOP-IC) provided with the small outline package. While the tab 7 currently formed in the plate shape of an approximately rectangle and the inner part 6a approach the long side of both tabs 7, respectively and are radiately allocated in it, this low-fever resistance type SOP-IC21, The outer part 6b currently formed successively by each inner part 6a respectively in one is provided with the lead 6 of two or more which is projected in the side by the side of the shorter side of the tab 7, respectively, and is crooked in the Galle wing shape.
The radiation fins 8 and 8 of the couple currently formed in rectangular plate shape are arranged on both shorter sides by the tab 7, respectively, and are formed successively in one.

[0013]The radiation fin 8 is arranged so that the projecting end part may be located in the center section in the sequence of the outer part 6b of the lead 6, and it is projected to the method of outside, and the projecting end part of the radiation fin 8 constitutes the outer part 9 substantially. These outer parts 9 are provided with a little larger width than the shorter side of the tab 7, and length is provided with length a little longer than the long side of the tab 7. Curvature forming of the outer part 9 of these radiation fins 8 is carried out to the upper part and the method of water Hiranai, respectively, and it is arranged so that it may lap in plane view with a crevice [above the resin seal package 20] mutually.
[0014]It is allotted to the surface and rear surface of the radiation fin 8 so that the rugged surface part 10 may cross in the direction which intersects perpendicularly with a radiation fin in a coupling end with the tab 7, and it is formed in it by suitable means, such as a coining process (coining) or etching processing.
[0015]The both-ends neighborhood of the radiation fin 8, the slits 11 and 11 of 1 set of couple are

allotted to a coupling end with the tab 7, respectively, and are ****(ed) by rectangular shape in one. Only a suitable interval is estranged mutually, both the slits 11 and 11 are allocated in parallel, and the resin filling portion 11A is substantially constituted by filling up with molding resin of the resin seal package 20.

[0016]On the tab 7, bonding of the pellet 15 which had the integrated circuit made is carried out by the suitable means, and two or more electrode pads 16 are arranged on approximately annular, and are formed in the outer periphery part in the upper surface of the pellet 15. These electrode pads 16 are arranged the lead 6 group side edge neighborhood of the pellet 15, respectively.

Between the inner parts 6a of each lead 6, bonding of the wire 18 is carried out to these, and it is bridged.

Therefore, signal circuits in the integrated circuit of the pellet 15 are electrically pulled out outside via the pad 16, the wire 18, and the lead 6.

[0017]And this low-fever resistance type SOP-IC21 is provided with the resin seal package 20 by which resin was used and integral moulding was carried out to the flatbed shape of the approximately rectangle with the transfer molding method etc., The non-hermetic seal of said tab 7, the inner part 6a of the lead 6, some radiation fins 8, the pellet 15, and the wire 18 is carried out with this resin seal package 20. Namely, the outer part 6b group of the lead 6 is projected, respectively from the side by the side of both the long sides in the resin seal package 20, and, as for the radiation fin 8, the outer part 9 is projected to the center section of the outer part 6b array of the lead 6 in the side by the side of both the long sides of the resin seal package 20. And the outer part 6b of the lead 6 is crooked downward in the exterior of the resin seal package 20, Furthermore, are crooked in a level outside direction, and it is formed in the Galle wing shape and each outer part 9 of the radiation fin 8 of a couple is crooked upward in the exterior of the resin seal package 20, Furthermore, it is crooked in level inboard, and it is arranged so that it may lap in plane view with a crevice [above the resin seal package 20] mutually.

[0018]The manufacturing method of low-fever resistance type SOP-IC which starts hereafter said composition which is one working example of the manufacturing method of the semiconductor device concerning this invention is explained. Composition of said low-fever resistance type SOP-IC is further clarified by this explanation.

[0019]In the manufacturing method of low-fever resistance type SOP-IC concerning this example, the multiple-string leadframe 1 constituted as shown in drawing 2 is manufactured.

[0020]The sheet metal which consists of iron system materials, such as copper system (copper or its alloy) materials, such as phosphor bronze and oxygen free copper, or covar, 42 alloys, is used, and integral moulding of this multiple-string leadframe 1 is carried out by suitable means, such as punching press working of sheet metal or etching processing. Two or more unit leadframes 2 are installed in the transverse direction by one row side by side at this multiple-string leadframe 1. However, as for the multiple-string leadframe 1, only one unit is illustrated.

[0021]The unit leadframe 2 is provided with one pair of outer frame 3 by which the tooling holes 3a are established, and both the outer frames 3 and 3 are installed in a parallel series at the predetermined intervals, respectively. In each unit leadframe 2, among both outer frames 3 and 3, Tiber 4 of a couple is mutually parallel to the dam member 5 and the outside of a couple, and it is allotted so that it may become an outer frame and a right angle, and lifting and holding are carried out in one. The lead 6 of two or more is allotted to a longitudinal direction at equal intervals by the dam member 5, and it is mutually parallel to it, and it protrudes in one so that it may intersect perpendicularly with the dam member 5. By being allotted so that the long side of both tabs which carry out the postscript of the tip may be approached, respectively and this may be surrounded, the inner end of each lead 6 constitutes the inner part 6a, respectively. On the other hand, the tip is connected to Tiber 4 in one, and the outside extension of each lead 6 constitutes the outer part 6b, respectively. And the portion during the adjacent lead 6 and 6 in the dam member 5 constitutes substantially the dam 5a which dams up the flow of resin at the time of package shaping mentioned later.

[0022]The radiation fins 8 and 8 of a couple are arranged on both dam members 5 and 5 in the

center section of the length direction, and it protrudes respectively in one so that it may intersect perpendicularly with the dam members 5 and 5. Between the inner ends of both the radiation fins 8 and 8, the tab 7 formed in the plate shape of an approximately rectangle is connected in one, and lifting and holding are carried out. On the other hand, as for the outside extension of both the radiation fins 8 and 8, the tip has extended outside Tiber 4.
This portion constitutes the outer part 9 substantially, respectively.

[0023]The rugged surface part 10 is allotted to the surface and rear surface of both the radiation fins 8 and 8, respectively so that it may cross in the direction which intersects perpendicularly with a radiation fin in the end of tab slippage to the dam member 5, and it is formed in it by suitable means, such as a coining process (coining) or etching processing.
[0024]The slit 11 of 1 set of couple is allotted to the end of tab slippage by the both-ends neighborhood of both the radiation fins 8 and 8 to the dam member 5, respectively, and is established in one. Only a suitable interval is estranged mutually, and both the slits 11 and 11 are allocated in parallel, and are formed in the rectangular shape of the size with which resin is certainly filled up in the forming cycle of the resin seal package mentioned later, respectively. That is, the resin filling portion 11A is substantially constituted by this slit 11.
[0025]The tab 7 is being moved back in the pellet thickness part grade and the direction of a rear face which carry out a postscript rather than the field of lead 6 group (what is called tab lowering).
[0026]Next, pellet bonding work, then wire bonding work will be done for every unit leadframe by the multiple-string leadframe constituted as mentioned above, and an assembly as shown in drawing 3 will be manufactured by these work. By carrying out pitch feed of the multiple-string leadframe to a transverse direction, these bonding work is done one by one for every unit leadframe.
[0027]First, the pellet 15 as a semiconductor integrated circuit element which had the integrated circuit (not shown) of a bipolar form made by pellet bonding work in what is called a previous process in the manufacturing process of a semiconductor device, It is allotted to the approximately center part on the tab 7 in each unit leadframe 2, and suitable bonding agents, such as silver paste, adhere via the bonding layer 14 formed by the pellet bonding apparatus (not shown) used.
[0028]Between the electrode pad 16 of the pellet 15 by which bonding was carried out to the tab 7, and the inner part 6a of each lead 6 in each unit leadframe 2, and a copper system, a golden system, Or by using a wire bonding apparatus [like an ultrasonic thermocompression bonding method] (not shown) whose wire 18 which the material of an aluminum system is used and is formed is, bonding is carried out, respectively and the both ends are bridged.
[0029]That is, two or more electrode pads 16 are arranged and formed in the outer periphery part in the upper surface of the pellet 15. These electrode pads 16 are arranged the lead group side edge neighborhood of the pellet 15, respectively.
Bonding of these electrode pads 16 is carried out between the inner parts 6a of each lead 6, and the wire 18 is bridged between.
Therefore, signal circuits in the integrated circuit of the pellet 15 will be electrically pulled out outside via the electrode pad 16, the wire 18, and the lead 6.
[0030]Thus, the package group which carries out a resin seal for every unit leadframe has a transfer molding device as shown in drawing 4 used by a pellet and the multiple-string leadframe by which wire bonding was carried out, and simultaneous shaping is carried out about a unit leadframe group at it.
[0031]The transfer molding device shown in drawing 4 is provided with the punch 31 and the bottom part 32 of a couple by which it is mold clamp carried out mutually with the cylinder device (not shown) etc., and to the mating face of the punch 31 and the bottom part 32 The punch cavity crevice 33a, The group recession is carried out by more than one, respectively so that the bottom part cavity crevice 33b may collaborate mutually and may form the cavity 33. When the multiple-string leadframe 1 concerning said composition is used and transfer moulding of the resin seal form package is carried out, each cavity 33 in the punch 31 and the bottom part 32 corresponds to the space between the dam members 5 and 5 of the couple in each unit leadframe 2, respectively.

[0032]The pot 34 is established by the mating face of the punch 31, and it is inserted in the pot 34 so that the plunger 35 which moves with a cylinder device (not shown) can feed resin (henceforth resin) as a molding material. While the cull 36 is allotted and recessed by the opposed position with the pot 34 at the mating face of the bottom part 32, it is allotted radiately and recessed so that the runner 37 of two or more sections may connect with the pot 34, respectively. The other end of each runner 37 is connected to the bottom cavity crevice 33b, respectively, and it is formed in the terminal area so that the gate 38 may pour in resin into the cavity 33. a rectangle a little larger so that it may escape to the mating face of the bottom part 32 and the hollow 39 can escape the thickness of a leadframe than the outside of the multiple-string leadframe 1 -- the thickness and abbreviation -- it is recessed by the constant depth of the equal size.
[0033]Next, the forming process of a resin seal package is explained about the case where the transfer molding device concerning said composition is used.
[0034]At the time of transfer moulding, in the escape hollow 39 recessed by the bottom part 32, it is allotted and the multiple-string leadframe 1 concerning said composition is set so that the pellet 15 in each unit leadframe 2 may be accommodated in each cavity 33, respectively. Then, it is mold clamp carried out of the punch 31 and the bottom part 32, and from the pot 34, the resin 40 is fed into each cavity 33 through the runner 37 and the gate 38 by the plunger 35, and it is pressed fit.
[0035]If resin heat-hardens after pouring and the resin seal package 20 is fabricated, while the mold opening of the punch 31 and the bottom part 32 will be carried out, resin seal package 20 group is released from mold with an ejector pin (not shown).
[0036]Thus, discharging of the multiple-string leadframe 1 which had package 20 group fabricated is carried out from the transfer molding device 30 as shown in drawing 5 and drawing 6. And the resin seal of the inner part 6a and the wire 18 of some of tabs 7, radiation fins 8, the pellet 15, and the lead 6 will be carried out to the inside of the package 20 resin-molded in this way. In this state, the resin filling portion 11A is substantially formed by filling up with resin in each slit 11.
[0037]After the multiple-string leadframe which had the resin seal package fabricated as mentioned above passes through plating down stream processing, With or the lead and radiation-fin cutting device which are shown in drawing 8 one by one for every unit leadframe in the lead and the radiation-fin cutting forming cycle as shown in drawing 7 before passing. After the outer frame 3, Tiber 4, and the dam 5a are separated, with the lead forming apparatus shown in drawing 9. Curvature forming of the outer part 9 of the radiation fin 8 is carried out to specified shape by the radiation-fin molding equipment which curvature forming of the outer part 6b of the lead 6 is carried out to the Galle wing shape, and is shown in drawing 11 and drawing 12.
[0038]Next, drawing 7 - drawing 12 are made reference, and a lead and a radiation-fin cutting forming cycle are explained.
[0039]The lead and the radiation-fin cutting molding equipment 50 which are used by this lead and a radiation-fin cutting forming cycle are provided with the feeder 51 as shown in drawing 7. The feeder 51 is constituted so that stepping delivery of the multiple-string leadframe 1 as a work may be carried out to one way with the pitch corresponding to the unit leadframe 2 with an intermittent feed device (not shown).
the multiple-string leadframe 1 by which the loader 52 is furnished to the end part (it is hereafter considered as a front end part.) of the feeder 51, and the loader 52 was accommodated in the rack etc. -- the feeder 51 top -- addressing ******** to one sheet -- it is constituted like. The lead and the radiation-fin cutting device 53 are furnished to the pars intermedia of the feeder 51, and this device is constituted as shown in drawing 8.
[0040]The lead forming apparatus 54 constituted as shown in drawing 9, and the radiation-fin molding equipment 100 constituted as shown in drawing 10 - drawing 11 are arranged and furnished to the side of the lead in the feeder 51, and the radiation-fin cutting device 53. Between a lead and the radiation-fin cutting device 53, and the lead forming apparatus 54, the hair drier 55, It is furnished so that IC part 57 as an intermediate product separated from the outer frame of the multiple-string leadframe 1 in the lead and the radiation-fin cutting device 53 may be held and it can transfer to the lead forming apparatus 54.

The feeder 101 is allocated between the lead forming apparatus 54 and the radiation-fin molding equipment 100.
[0041]The unloader 56 is furnished to the rear end part of the feeder 51, This unloader 56 is constituted so that the frame (frame) part 58 as residue parts of the multiple-string leadframe 1 from which IC part 57 was clipped in the lead and the radiation-fin cutting device 53 may be given one by one and may be discharged from the feeder 51.
[0042]The lead and the radiation-fin cutting device 53 which are shown in drawing 8 are provided with the upper part tie-down plate 60 and the bottom tie-down plate 70, and the upper part tie-down plate 60 by moving up and down with a cylinder device (not shown), It is constituted so that it may approach and desert to the bottom tie-down plate 70 fixed on the machine stool. The holders 61 and 71 are attached to both the tie-down plates 60 and 70 fixed, respectively, and the alignment of upper part presser-foot type 62 and bottom presser-foot type 72 (it may be hereafter called the punch 62 and the bottom part 72.) is mutually carried out to both the holders 61 and 71, and it is held, respectively. The punch 62 and the bottom part 72 are formed in the abbreviated channel die steel shape which will be in the state of inside doubling also mutually, respectively, and the punch 62 and the bottom part 72 by the rear parts 63 and 73 on either side. It is constituted so that the root part in the outer part 6b of the lead 6 and the outer part 9 of the radiation fin 8 may be pressed down from the upper and lower sides. Like the frame presser foot which carries out a postscript, the punch 62 is constituted so that independent suspension may be carried out by the guide 68 and the spring 69.
[0043]To the upper part holder 61, the punch 64 formed in approximately sinking comb shape (not shown) A couple, It is allotted so that it may correspond to the pitch of lead 6 group, and the width of the outer part 9 of the radiation fin 8 in right-and-left both the sides of the punch 62, It is fixed downward [vertical], and it is constituted so that the shearing edge 66 may be arranged on the edge in a sinking comb by the punch 64, it may collaborate with the shearing die which carries out a postscript in it and the outer frame 3, Tiber 4, and the dam 5a may be cut off. The frame presser foot 67 fits into the guide 68 slidably, and is supported by the upper part holder 61, enabling free up-and-down motion, and the frame presser foot 67 is constituted so that independent suspension may be carried out in the state where it was always caudad energized by the spring 69. With this spring 69, the frame presser foot 67 compresses the outer frame 3 of a leadframe, and Tiber 4 between the shearing die upper surfaces which carry out a postscript, and is pressed down.
[0044]On the other hand, the shearing die 76 of a couple is arranged on the bottom part 72 by right-and-left both the sides of the rear part 73, and it is formed in the shape along the undersurface of lead shape, and the shearing die 76 is formed so that it may collaborate with the shearing edge 66 of said punch 64 and the outer frame 3, Tiber 4, and the dam 5a may be cut off.
[0045]The lead forming apparatus 54 shown in drawing 9 is provided with the upper part tie-down plate 80 and the bottom tie-down plate 90, and by moving up and down with a cylinder device (not shown), the upper part tie-down plate 80 is constituted so that it may approach and desert to the bottom tie-down plate 90 fixed on the machine stool. The holders 81 and 91 are attached to both the tie-down plates 80 and 90 fixed, respectively, and the alignment of upper part presser-foot type 82 and bottom presser-foot type 92 (it may be hereafter called the punch 82 and the bottom part 92.) is mutually carried out to both the holders 81 and 91, and it is held, respectively. The punch 82 and the bottom part 92 are formed in the abbreviated channel die steel shape which will be in the state of inside doubling also mutually, respectively, and the punch 82 and the bottom part 92 by the rear parts 83a and 83b on either side, and 93a and 93b. It is constituted so that the root part in the outer part 6b of the lead 6 may be pressed down from the upper and lower sides. The punch 82 is constituted so that independent suspension may be carried out by the guide 88 and the spring 89.
[0046]It is allotted to the upper part holder 81 so that the forming punch 84 may correspond to the width of the pitch of lead 6 group in a couple and right-and-left both the sides of the punch 82, It is fixed downward [vertical], and this punch 84 is constituted so that it may collaborate with the forming die which carries out a postscript and curvature forming of the outer part 6b of the lead 6 can be carried out to the Galle wing shape. The curved surface shape part 85 is formed in the inner shoulder which ****s to the outer part 6b of the punch 84 with suitable curvature.

[0047]On the other hand, the forming die 94 of a couple is allotted to right-and-left both the sides of the rear part 93 by the bottom part 92, and is formed in it at the shape which imitates the Galle wing shape of the outer part 6b of each lead 6 after shaping, respectively.
[0048]The alignment of upper part presser-foot type 110 and the bottom presser-foot type 120 which are fixed on the machine stool is carried out mutually, and the radiation-fin molding equipment 100 shown in drawing 11 and drawing 12 is allocated. With upper part presser-foot type 110 and bottom presser-foot type 120, the rear parts 110a and 110b on either side, Although it is constituted so that the root part in the outer part 9 of the radiation fin 8 may be pressed down from the upper and lower sides by 120a and 120b, and upper part presser-foot type 110 is not illustrated, it is constituted like the lead forming apparatus shown in drawing 9 so that up-and-down motion is possible.
[0049]The bottom presser-foot boards 121 and 122 are formed in the both sides of bottom presser-foot type 120, respectively so that up-and-down motion is possible, as shown in drawing 11.
On both sides of upper part presser-foot type 110, further, outside, said bottom presser-foot boards 121 and 122 are formed so that up-and-down motion of the rolls 111 and 112 is possible respectively.
By moving to a sliding direction, these rolls 111 and 112 are constituted so that curvature forming of the outer part 9 of the radiation fin 8 can be carried out right-angled on the basis of the bottom presser-foot boards 121 and 122.
[0050]Rolls 113 and 114 with the another rolls 111 and 112 of said couple are formed in the both sides of upper part presser-foot type 110 so that up-and-down motion is possible, as shown in drawing 12. These rolls 113 and 114 comprise moving to a sliding direction so that curvature forming of the outer part 9 of the radiation fin 8 by which curvature forming was carried out can be carried out still more nearly right-angled with the rolls 111 and 112 of said couple upper part presser-foot type 110 and on the basis of the rear part of bottom presser-foot type 120. The window holes 123 and 124 are formed in both sides of the side which the outer part 9 of the radiation fin 8 arranges, respectively so that the curvature forming part of the outer part 9 of the radiation fin 8 can be inserted in bottom presser-foot type 120.
It has the space 125 inside so that said curvature forming part can furthermore be arranged.

[0051]Next, the operation about the lead concerning said composition and radiation-fin cutting molding equipment is explained.
[0052]As mentioned above, the multiple-string leadframe 1 which solder plating processing was carried out or is not processed is accommodated in addressing to two or more sheets, a rack, etc., and is supplied to the loader 52 of a lead and the radiation-fin cutting molding equipment 50. The multiple-string leadframe 1 fed by the loader 52 is paid out of a rack etc. one by one on addressing to one sheet, and the feeder 51 with the loader 52, and goes. Addressing stepping delivery to 1 pitch of the multiple-string leadframe 1 paid out to the feeder 51 is carried out with the interval between the unit leadframes 2 and 2 by the feeder 51.
[0053]And the unit leadframe 2 is supplied one by one to the multiple-string leadframe 1 by which stepping delivery is carried out in the feeder 51 top by a lead and the radiation-fin cutting device 53, and it goes.
[0054]Here, the operation about a lead and a radiation-fin cutting device is explained.
[0055]As the unit leadframe 2 drops the package 20 into the bottom part 72, it is set to a crevice by stepping delivery about the multiple-string leadframe 1, as shown in drawing 8. Thereby, the lead 6 and the Nemoto part in the outer parts 6b and 9 of the radiation fin 8 contact the rear part 73 of the bottom part 72.
[0056]Next, if the upper part tie-down plate 60 descends with a cylinder device, the punch 62 and the frame presser foot 67 will double with the bottom part 72 according to the energizing force of the spring 69. Thereby, the lead 6 and the Nemoto part in the outer parts 6b and 9 of the radiation fin 8 are compressed and fixed between the rear part 63 of the punch 62, and the rear part 73 of the bottom part 72. The outer frame 3 and Tiber 4 are compressed and fixed between the frame presser

foot 67 and the shearing die 76 upper surface.
[0057]Then, if the upper part tie-down plate 60 descends further and goes, the punch 64 will descend and it will go. Since the compression set of the spring 89 is carried out at this time as for the punch 62 and the frame presser foot 67, it is pressed by the bottom part 72 and the shearing die 76. The outer frame 3, Tiber 4, and the dam 5a are separated from the lead 6 and the radiation fin 8 with descent of the punch 64 by shearing by collaboration with the shearing edge 66 of the punch 64, and the shearing die 76.
[0058]After the punch 64 ends a predetermined stroke, the punch 64 goes up with the upper part tie-down plate 60, and is returned to the original waiting state.
[0059]In a lead and the radiation-fin cutting device 53, if cutting is completed and the upper part tie-down plate 60 goes up, IC part 57 which is the intermediate product cut off from the outer frame 3 of the multiple-string leadframe 1 will be transferred from on the bottom part 72 by the hair drier 55 to up to the bottom part 92 in the lead forming apparatus 54.
[0060]If IC part 57 is transferred to the lead forming apparatus 54, stepping delivery of the multiple-string leadframe 1 will be carried out by 1 pitch of the unit leadframe 2 by the feeder 51, and cutting described above about the unit leadframe 2 of the next step will be carried out.
[0061]Henceforth, cutting mentioned above about each unit leadframe 2 is repeated, and the multiple-string leadframe 1 goes.
[0062]And the frame (frame) part 58 as residue of the multiple-string leadframe 1 which cutting about all the unit leadframes 2 ended is taken down from on the feeder 51 in the unloader 56, and are collected at a predetermined place.
[0063]IC part 57 supplied to the lead forming apparatus 54 has lead-forming work done by this lead forming apparatus on the other hand.
[0064]Subsequently, the operation about the lead forming apparatus 54 is explained.
[0065]IC part 57 has the package 20 dropped into a crevice by the bottom part 92, and it is made and set as shown in drawing 9. Thereby, the root part in the outer part 6b of the lead 6 contacts the rear parts 93b and 93a of the bottom part 92, respectively.
[0066]Next, the upper part tie-down plate 80 descends with a cylinder device, and the punch 82 doubles with the bottom part 92 according to the energizing force of the spring 89. Thereby, in between the rear parts 83a and 83b of the punch 82, and the rear parts 93a and 93b of the bottom part 92, the root part in the outer part 6b of the lead 6 as a flection is compressed, respectively, and is fixed.
[0067]Then, if the upper part tie-down plate 80 descends further and goes, the punch 84 will descend and it will go. Since the compression set of the spring 89 is carried out at this time as for the punch 82, it is pressed by the bottom part 82.
[0068]If the punch 84 descends to the forming die 94, by being pushed against the forming die 94 with descent of the punch 84, the lead 6 will be crooked so that this forming die 94 may be imitated, and will be fabricated by the desired Galle wing shape. Thus, the outer part 6b of the lead 6 formed in the Galle wing shape projects caudad very more slightly [the undersurface (side principal surface with a field)] than the package 20 undersurface.
[0069]After the punch 84 ends a predetermined stroke, the punch 84 goes up and is returned to the original waiting state.Then, fabricated IC part 130 (refer to drawing 10) is removed from the bottom part 92, with the feeder 101, is fed by the radiation-fin molding equipment 100 with which a next process is carried out, and goes.
[0070]As for IC part 130 sent to the radiation-fin molding equipment 100 by the feeder 101, curvature forming of the outer part 9 of the radiation fin 8 is carried out here. Hereafter, the operation about the radiation-fin molding equipment 100 is explained.
[0071]IC part 130 as an intermediate product in which curvature forming of the outer part 6b of the lead 6 was carried out to the Galle wing shape at the aforementioned process is set to bottom presser-foot type 120 as shown in drawing 11. Thereby, the root part in the outer part 9 of the radiation fin 8 contacts the rear parts 120a and 120b of the right and left of bottom presser-foot type 120, respectively.

[0072]Next, upper part presser-foot type 110 descends, and between the rear parts 110a and 110b of upper part presser-foot type 110, and the rear parts 120a and 120b of bottom presser-foot type 120, the root part in the outer part 9 of the radiation fin 8 as a flection is compressed, respectively, and is fixed.
[0073]Then, the rolls 111 and 112 of a couple descend and it goes. Descent of both the rolls 111 and 112 will carry out curvature forming of the outer part 9 of the radiation fin 8 with the rolls 111 and 112 right-angled caudad considering the bottom presser-foot boards 121 and 122 arranged inside the rolls 111 and 112 as a reference point.
[0074]Under the present circumstances, the position from the root part of the outer part 9 of the radiation fin 8 in the bottom presser-foot boards 121 and 122 on either side, Since the direction of the bottom presser-foot board [on the other hand / (left-hand side)] 121 is arranged in the distance position more distant than the bottom presser-foot board 122 of another side (right-hand side), difference of the position bent of each outer part 9 in the radiation fin 8 on either side is carried out. The outer part 9 of the radiation fin [on the other hand / (left-hand side)] 8 is crooked in the position further than the outer part 9 of the radiation fin 8 of another side (right-hand side) from a root part.

[0075]After curvature forming with both the rolls 111 and 112 finishes, the rolls 111 and 112 on either side move to an upper prescribed position, and the bottom presser-foot boards 121 and 122 on either side stand by till the curvature forming of the following IC part while moving to a downward prescribed position.
[0076]Then, the rolls 113 and 114 of couple with said another rolls 111 and 112 descend, and it goes as shown in drawing 12. Descent of these rolls 113 and 114 will carry out curvature forming of the outer part 9 of the radiation fin 8 with the rolls 113 and 114 right-angled caudad considering the rear part of upper part presser-foot type 110 and bottom presser-foot type 120 as a reference point.
[0077]by the above, the outer part 9 of the radiation fin 8 of a couple is crooked from a root part, respectively -- each curvature forming part -- the upper surface (in drawing 12, it arranges to the down side) of the resin seal package 20 of IC part 130 -- a wrap -- it is arranged so that it may be made like, a crevice may be opened mutually and it may lap in plane view.
[0078]It means that low-fever resistance type SOP-IC21 which starts said composition as mentioned above was manufactured.
[0079]In the printed-circuit board 22, low-fever resistance type SOP-IC21 concerning said composition is used, carrying out a surface mount as shown in drawing 1 and drawing 13.
[0080]That is, the land 23 is allotted to two rows so that more than one may correspond on the printed-circuit board 22 in the outer part 6b group of the lead 6 of low-fever resistance type SOP-IC21, it has solder material etc. used, and is formed in the Kodaira plate shape of an approximately rectangle.
[0081]When the surface mount of low-fever resistance type SOP-IC21 is carried out to this printed-circuit board 22, the outer part 6b group of the lead 6 of this SOP-IC21 has cream solder material (not shown) sandwiched by the land 23 on the printed-circuit board 22, and is contacted, respectively. Then, since the soldering part 25 will be formed between the outer part 6b group of a lead, and the land 23 by suitable means, such as reflow solder processing, if solidified after melting of the cream solder material is carried out, It is connected to the printed-circuit board 22 electrically and mechanically, and a surface mount will be carried out by low-fever resistance type SOP-IC21.
[0082]Since bonding of the pellet 15 is directly carried out to the tab 7 which was united in the radiation fin 8 if the pellet 15 generates heat during operation in said mounted state, heat will be directly spread to the radiation fin 8, and will radiate heat effectively through the radiation fin 8.
[0083]Here, the heat spread to the radiation fin 8 radiates heat from the pellet 15 to outer space through the outer part 9 of the radiation fin 8. And since the crevice is established between the outer parts 9 and 9 of the upper and lower sides arranged so that it may lap [further / heat dissipation nature is good and / above the resin seal package 20] mutually in plane view, since the heat sinking plane product of the outer part 9 of the radiation fin 8 is large, By carrying out air cooling of the

outer part 9 of the upper portion of the resin seal package 20, heat dissipation nature improves further.

[0084]Since the interface of the radiation fin 8 and the resin seal package 20 becomes large when the radiation fin 8 projects in the exterior of the resin seal package 20 with a large opening on the other hand, the permeation possibility of the moisture from the interface increases, and it is possible that moisture resistance falls.

[0085]However, in this example, since it is formed so that the rugged surface part 10 may cross the radiation fin 8 in the inside of the resin seal package 20 to the radiation fin 8, a damp-proof fall will be controlled effectively. That is, it is because the leak path to the pellet 15 in the radiation fin 8 becomes long by the rugged surface part 10.

[0086]According to said working example, the following effect is acquired.

** Since a heat sinking plane product can be enlarged by being arranged so that each outer part of two or more projected radiation fins may be crooked and it may lap mutually in plane view [above a resin seal package] from the side of the resin seal package of a semiconductor device, heat dissipation nature can be made good.

[0087]** Since air cooling of the outer part is carried out by establishing the crevice between the outer parts arranged so that it may lap mutually in plane view [above the above-mentioned resin seal package], heat dissipation nature is further made to fitness.

[0088]** By the aforementioned **, it is low-fever resistance type and, moreover, the small semiconductor device of an outside can be obtained.

[0089]** In the aforementioned **, since a radiation fin is formed in a tab at one and a separate part is not attached, it can manufacture cheaply.

[0090]Drawing 14 and drawing 15 are what shows low-fever resistance type IC provided with the quad flat and the resin seal package (QFP) which is working example 2 of this invention, Drawing 14 is a top view of IC part 130A before curvature forming of the radiation fin is carried out, and drawing 15 is a front view showing QFP-IC 21A which curvature forming of the outer part 9A of the radiation fin 8A in the IC part 130A was carried out, and was formed.

[0091]in this example 2, from four sides of the resin seal package 20, two or more outer parts 6b of a lead project, and are carried out, and the outer part 9A of the four radiation fins 8A is projected and made into the diagonal direction from four corners of the resin seal package 20, respectively. Each radiation fins 8A are formed successively by four corners of the tab 7 in one, and the outer part 9A of each radiation fin 8A is provided with the square part 191 which makes the same size as the resin seal package 20 at the tip of the long and slender straight part 190. These square parts 191 are formed so that the resin seal package 20 and symmetrical shape may be made to the straight line which makes the straight part 190 and a right angle.

[0092]And curvature forming of the outer part 9A of each radiation fin 8A is carried out so that it may lap in plane view with a crevice in the upper portion of the resin seal package 20 mutually, respectively. Therefore, even if the pellet which adhered on the tab 7 during operation in the mounted state generates heat, that heat is spread by this QFP-IC 21A from the tab 7 to the radiation fin 8A, and it radiates heat good to outer space from the outer part 9A of the radiation fin 8A arranged to the upper portion of the resin seal package 20.

[0093]As for QFP-IC 21A concerning this example 2, [above the resin seal package 20], like said working example 1, since outer one 9A of the four radiation fins 8A laps mutually and is arranged by plane view, a heat sinking plane product becomes very large, therefore heat radiating ability becomes very large.

[0094]Since the crevice is formed between the outer parts 9A arranged so that it may lap mutually in plane view [above the resin seal package 20], air cooling of the radiator will be carried out and heat dissipation nature improves further.

[0095]Since it arranges so that the square part 191 of a form of the outer part 9A of the radiation fin 8A arranged above the resin seal package 20 may correspond in the resin seal package 20 and plane view, small outside-ization can be attained.

[0096]Drawing 16 and drawing 17 are what shows SOP-IC which is working example 3 of this

invention, The top view and drawing 17 (a) and (b) which drawing 16 shows IC part 130B before curvature forming of the radiation fin is carried out are the front view and side view showing SOP-IC 21B which curvature forming of outer one 9B of the radiation fin 8B in the IC part 130B was carried out, and was formed.

[0097]in this example, from the both side surfaces which make the long side of the resin seal package 20 which makes rectangular form, two or more outer parts 6b of a lead project, and are carried out, and the outer part 9B of the radiation fin 8B is projected and made into the longitudinal direction, respectively from the both side surfaces which make the shorter side of the resin seal package 20. Each radiation fins 8B are formed successively by the tab 7 respectively in one, and the outer part 9B of each radiation fin 8B is provided with the rectangle part 193 which makes the same size as the resin seal package 20 following the narrow part 192. These rectangle parts 193 are formed so that the resin seal package 20 and symmetry may be made to the straight line of the short side direction of the resin seal package 20.

[0098]And curvature forming of the outer part 9B of each radiation fin 8B is carried out so that it may lap in plane view with a crevice in the upper portion of the resin seal package 20 mutually, respectively. Therefore, even if the pellet which adhered on the tab 7 during operation in the mounted state also about this SOP-IC 21B generates heat, The heat is spread from the tab 7 to the radiation fin 8B, and radiates heat good to outer space from the outer part 9B of the radiation fin 8B arranged to the upper portion of the resin seal package 20. This SOP-IC 21B will also demonstrate the same effect as above-mentioned QFP-IC 21A.

[0099]Drawing 18 and drawing 19 are what shows QFP-IC which is working example 4 of this invention, They are a top view in which drawing 18 shows IC part 130C before curvature forming of the radiation fin is carried out, and a front view in which the outer part 9C of the radiation fin [in / in drawing 19 / the IC part 130C] 8C shows QFP-IC 21C which curvature forming was carried out and was formed.

[0100]In this example 4, from four sides of the resin seal package 20, the outer part 6b of the lead has projected two or more, and formed protruding of the radiation fin 8C is further carried out from four sides of the resin seal package 20, respectively. The four radiation fins 8C are formed successively by four corners of the tab 7 respectively in one. The straight parts 194 and 195 of the couple which has projected the outer part 9C of the radiation fin 8C outside the outer part 6b of a lead in parallel with outer one 6b of a lead in the both-sides position of the outer part 6b of a lead of two or more in the one side face of the resin seal package 20, It comprises the rectangle part 196 connected between the tip parts of these straight parts, and it is provided so that it may surround outer one 6b of a lead of two or more in the straight parts 194 and 195 and the rectangle part 196.

[0101]And in the side of the resin seal package 20, after it is crooked up, the outer part 9C of each radiation fin 8C is crooked in level inboard, and it is side view, and curvature forming is further carried out, respectively so that approximately KO type shape may be made. The upper bed side of the outer part 9C of these radiation fins 8C makes the upper surface and the same height position of the resin seal package 20, or is arranged at the position lower than the upper surface of the resin seal package 20. Therefore, since the overall height of QFP-IC does not become high, it is suitable when it desires a thin type.

[0102]Although the invention made by this invention person above was concretely explained based on working example, it cannot be overemphasized that it can change variously in the range which this invention is not limited to said working example, and does not deviate from the gist.

[0103]For example, although the above explanation explained the case where the invention mainly made by this invention person was applied to low-fever resistance type SOP-IC and QFP-IC used as the background which are fields of the invention, It is applicable to not the thing limited to it but low-fever resistance type SOJ-IC provided with small outline, J RIRIDDO, and a resin seal package, QFJ (PLCC), IC, etc.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a perspective view showing the mounted state of the low-fever resistance type semiconductor device which is one working example of this invention.
[Drawing 2]It is a multiple-string leadframe **** part abbreviation top view used for the manufacturing method of a low-fever resistance type semiconductor device.
[Drawing 3]the pellet and wire bonding process back is shown -- it is an abbreviation top view in part.
[Drawing 4]the forming cycle of a resin seal package is shown -- it is an abbreviation transverse-plane sectional view in part.
[Drawing 5]the resin seal package shaping-back is shown -- it is an abbreviation part cut plane figure in part.
[Drawing 6]the -- it is an abbreviation part cutting front view in part.
[Drawing 7]It is an outline top view showing a lead and radiation-fin cutting molding equipment.
[Drawing 8]It is a transverse-plane sectional view showing a lead and a radiation-fin cutting device.
[Drawing 9]It is a transverse-plane sectional view showing a lead forming apparatus.
[Drawing 10]the lead-forming process back is shown -- it is an abbreviation part cut plane figure in part.
[Drawing 11]radiation-fin molding equipment is shown -- in part, with an abbreviation transverse-plane sectional view, (a) shows 1st-step curvature forming before, and (b) shows the curvature forming back.
[Drawing 12]radiation-fin molding equipment is shown -- in part, with an abbreviation transverse-plane sectional view, (a) shows 2nd-step curvature forming before, and (b) shows the curvature forming back.
[Drawing 13]a low-fever resistance type semiconductor device is shown -- it is a cutting front view in part.
[Drawing 14]It is a top view showing curvature forming before of the radiation fin of the semiconductor device shown in drawing 15.
[Drawing 15]It is a front view showing the semiconductor device which is working example 2 of this invention.
[Drawing 16]It is a top view showing curvature forming before of the radiation fin of the semiconductor device shown in drawing 17.
[Drawing 17]The semiconductor device which is working example 3 of this invention is shown, (a) is a front view and (b) is a side view.
[Drawing 18]It is a top view showing curvature forming before of the radiation fin of the semiconductor device shown in drawing 19.
[Drawing 19]It is a front view showing the semiconductor device which is working example 4 of this invention.
[Description of Notations]
1 [-- Tiber,] -- A multiple-string leadframe, 2 -- A unit leadframe, 3 -- An outer frame, 4 5 [-- An outer part, 7 / -- Tab,] -- A dam member, 6 -- A lead, 6a -- An inner part, 6b 8, 8A, 8B, 8C -- A radiation fin, 9, 9A, 9B, 9C -- Outer part, 10 [-- Bonding layer,] -- A rugged surface part, 11 -- A slit, 11A -- A resin filling portion, 14 15 [-- Package,] -- A pellet, 16 -- An electrode pad, 18 -- A wire, 20 21 21B -- Low-fever resistance type SOP-IC (semiconductor device), 21A, 21C -- Low-fever resistance type QFP-IC (semiconductor device), 22 [-- Transfer molding device,] -- A printed-circuit board, 23 -- A land, 25 -- A soldering part, 30 31 [-- Punch cavity crevice,] -- A punch, 32 -- A bottom part, 33 -- A cavity, 33a 33b -- A bottom part cavity crevice, 34 -- A pot, 35 -- Plunger, 36 [-- An escape hollow 40 / -- Resin,] -- Cull, 37 -- A runner, 38 -- A gate, 39 50 -- A lead and radiation-fin cutting molding equipment, 51 -- A feeder, 52 -- Loader, 53 [-- An unloader, 57 / -- An IC part, 58 / -- A frame (frame) part, 60, 70 / -- An adapter plate, 61 71 / -- A holder, 62,] -- A lead and a radiation-fin cutting device, 54 -- A lead forming apparatus, 55 -- A hair drier, 56 72 [-- Shearing edge,] -- A presser-foot type, 63, 73 -- A rear part, 64 -- A punch, 66 76 [-- Spring,] -- A shearing die, 67 -- A frame presser foot, 68 -- A guide, 69 80, 90 -- An adapter plate, 81, 91 -- A

holder, 82, 92 -- Presser-foot type, 83a, 83b, 93a, 93b -- A rear part, 84 -- A forming punch, 94 -- Forming die, 88 [-- Feeder,] -- A guide, 89 -- A spring, 100 -- Radiation-fin molding equipment, 101 110 -- A upper part presser-foot type, 110a, 110b -- An upper part rear part, 111, 112, 113, 114 -- Roll, 120 -- A bottom presser-foot type, 120a, 120b -- A bottom rear part, 121, 122 -- Bottom presser-foot board, 123, 124 [-- A straight part, 191 / -- A square part, 192 / -- A narrow part, 193 / -- A rectangle part, 194, 195 / -- A straight part, 196 / -- Rectangle part.] -- A window hole, 125 -- Space, 130, 130A, 130B, 130C -- An IC part, 190

DRAWINGS

[Drawing 1]

[Drawing 8]

[Drawing 2]

[Drawing 3]

[Drawing 4]

[Drawing 9]

[Drawing 11]

[Drawing 5]

[Drawing 6]

[Drawing 7]

[Drawing 12]

[Drawing 14]

[Drawing 10]

[Drawing 13]

[Drawing 15]

[Drawing 18]

[Drawing 16]

[Drawing 17]

[Drawing 19]

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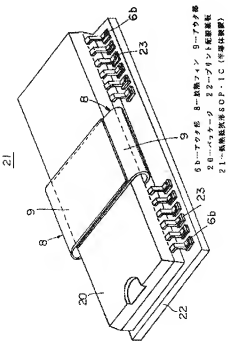
(54)【発明の名称】　半導体装置およびその製造方法並びにそれに使用されるリードフレーム

(57)【要約】

【目的】　外形が小形で放熱性の良好な半導体装置を得る。

【構成】　ペレット１５がボンディングされたタブ７に一対の放熱フィン８、８が連設され、両放熱フィン８、８のそれぞれのアウタ部９が樹脂封止パッケージ２０の外部で屈曲され、しかも、パッケージ２０の上方において互いに隙間をあけて平面視で重なるように配置されている。

【効果】　ペレット１５の発熱はタブ７から放熱フィン８に直接伝播されて、放熱フィン８からパッケージ２０外部のアウタ部９に導出される。両アウタ部９、９は重ねられているため、放熱面積が大きく放熱能力大である。しかし、重ねられているので、アウタ部９による外形の大形化は抑制される。



【特許請求の範囲】

【請求項1】　半導体ペレットがボンディングされているタブと、半導体ペレットに電気的にそれぞれ接続されている複数本のリードと、前記タブに連結されている複数個の放熱フィンと、タブ、ペレット、各リードの一部および各放熱フィンの一部を樹脂封止するパッケージとを備えている半導体装置において、

前記樹脂封止パッケージの側面から突出された前記複数個の放熱フィンのそれぞれのアウタ部が屈曲されて前記樹脂封止パッケージの上方において平面視で互いに重なるように配置されていることを特徴とする半導体装置。

【請求項2】　前記樹脂封止パッケージの上方において平面視で互いに重なるように配置されている放熱フィンのそれぞれのアウタ部の間に隙間が設けられていることを特徴とする請求項1記載の半導体装置。

【請求項3】　タブと、このタブに近接されて配設されている複数本のリードと、前記タブに一体的に連結されている複数個の放熱フィンとを備えているリードフレームであって、前記各放熱フィンが樹脂封止後に樹脂封止パッケージから突出し、さらにその突出した各アウタ部が屈曲成形されて樹脂封止パッケージの上方において平面視で互いに重なるように形成される長さを備えているリードフレームが準備される工程と、

前記工程により準備されたリードフレームのタブ上に半導体ペレットがボンディングされる工程と、

前記工程によりボンディングされた半導体ペレットの電極パッドと前記各リードのインナ部との間にワイヤの両端がボンディングされる工程と、

樹脂が用いられて樹脂封止パッケージが、前記タブ、半導体ペレット、リードのインナ部、放熱フィンの一部およびワイヤを樹脂封止するように成形される工程と、

樹脂封止パッケージから突出した複数個の放熱フィンのそれぞれのアウタ部が、屈曲されて前記樹脂封止パッケージの上方において平面視で互いに重なるように成形される工程と、を備えていることを特徴とする半導体装置の製造方法。

【請求項4】　タブと、このタブに近接されて配設されている複数本のリードと、前記タブに一体的に連結されている複数個の放熱フィンを備えているリードフレームであって、前記各放熱フィンが樹脂封止後に樹脂封止パッケージから突出し、さらにその突出した各アウタ部が屈曲成形されて樹脂封止パッケージの上方において平面視で互いに重なるように形成される長さを備えていることを特徴とするリードフレーム。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、半導体装置の製造技術、特に、放熱フィンを備えている低熱抵抗形半導体装置に利用して有効なものに関する。

【０００２】

【従来の技術】従来、表面実装形パッケージを備えている半導体装置の放熱性を向上させる技術としては、日経マグロウヒル社発行「日経マイクロデバイス１９８９年９月号」Ｐ９１、に記載されているように、樹脂封止パッケージの内外に別部品としてヒートスプレッダと外付け放熱フィンとを取り付ける技術がある。

【０００３】しかしながら、この技術は別部品を取り付けるために高価になる。

【０００４】そこで、表面実装形パッケージを備えている低熱抵抗形半導体装置として、例えば、特開昭６１－１５２０５１号公報に記載されているように、一つのタブに複数の放熱フィンが一体的に形成されており、この放熱フィンの一部が樹脂封止パッケージの外部へ突出されている半導体装置であって、前記放熱フィンの突出部が幅広に形成されているとともに、ガル・ウイング形状に屈曲成形されているものがある。

【０００５】

【発明が解決しようとする課題】しかしながら、上記構造のものでは、半導体装置の外形の小形化を図ると、放熱能力が限られ、所定の電力対応までしか許容できない。

【０００６】本発明の目的は、半導体装置の外形の小形化と低熱抵抗化の向上とを図ることにある。

【０００７】本発明の前記ならびにその他の目的と新規な特徴は、本明細書の記述および添付図面から明らかになるであろう。

【０００８】

【課題を解決するための手段】本願において開示される発明のうち代表的なものの概要を説明すれば、次の通りである。

【０００９】すなわち、半導体ペレットがボンディングされているタブと、半導体ペレットに電気的にそれぞれ接続されている複数本のリードと、前記タブに連結されている複数個の放熱フィンと、タブ、ペレット、各リードの一部および各放熱フィンの一部を樹脂封止するパッケージとを備えている半導体装置において、前記樹脂封止パッケージの側面から突出された前記複数個の放熱フィンのそれぞれのアウタ部が屈曲されて前記樹脂封止パッケージの上方において平面視で互いに重なるように配置されていることを特徴とする。

【００１０】

【作用】前記した手段によれば、タブ上に固着されたペレットが発熱しても、その熱はタブから放熱フィンに伝播され、樹脂封止パッケージの上方部に配置された放熱フィンのアウタ部から外部空間に良好に放熱される。そして、この場合、複数個の放熱フィンのアウタ部が樹脂封止の上方部において平面視で互いに重なるように配置されているため、放熱面積を大きなものにできて、放熱能力を大きくできる。また、半導体装置全体としての外形寸法が大きくならないので、小形で放熱能力の大きな

半導体装置を得ることができる。

【0011】

【実施例】図1は本発明の一実施例である低熱抵抗形半導体装置の実装状態を示す斜視図、図2～図19はその製造方法を説明する各説明図である。

【0012】本実施例において、本発明に係る低熱抵抗形半導体装置は、スモール・アウトライン・パッケージを備えている低熱抵抗形半導体集積回路装置（以下、低熱抵抗形SOP・ICという。）として構成されている。この低熱抵抗形SOP・IC21は、略長方形の板形状に形成されているタブ7と、インナ部6ａがタブ7の両方の長辺にそれぞれ近接されて放射状に配設されているとともに、各インナ部6ａにそれぞれ一体的に連設されているアウタ部6ｂが、タブ7の短辺側の僅方にそれぞれ突出されてガル・ウイング形状に屈曲されている複数本のリード6とを備えており、タブ7には長方形の板形状に形成されている一対の放熱フィン8、8が両方の短辺にそれぞれ配されて一体的に連設されている。

【0013】放熱フィン8はその突出端部がリード6のアウタ部6ｂの列における中央部に位置するように配されて外方へ突出されており、放熱フィン8の突出端部はアウタ部9を実質的に構成している。これらのアウタ部9はタブ7の短辺より若干大きい幅を備えており、長さはタブ7の長辺よりも若干長い長さを備えている。これらの放熱フィン8のアウタ部9はそれぞれ上方および水平内方に屈曲成形されて、樹脂封止パッケージ20の上方において互いに隙間をもって平面視で重なるように配置されている。

【0014】また、放熱フィン8の表裏面には凹凸面部10がタブ7との連結端部において放熱フィンと直交する方向に横断するように配されて、コイニング加工（圧印加工）またはエッチング加工等のような適当な手段により形成されている。

【0015】さらに、放熱フィン8の両端辺には一対1組のスリット11、11が、タブ7との連結端部にそれぞれ配され、矩形形状に一体的に切設されている。両スリット11、11は互いに適当な間隔だけ離間されて平行に配設されており、樹脂封止パッケージ20の成形樹脂が充填されることにより、樹脂充填部11Aが実質的に構成されている。

【0016】タブ7上には集積回路を作り込まれたペレット15が適当な手段によりボンディングされており、ペレット15の上面における外周縁部には複数個の電極パッド16が暗環状に配されて形成されている。これら電極パッド16は、ペレット15のリード6群側端辺にそれぞれ配されており、これらには各リード6のインナ部6ａとの間にワイヤ18がボンディングされて橋絡されている。したがって、ペレット15の集積回路における信号回路等はパッド16、ワイヤ18、リード6を介して電気的に外部に引き出されるようになっている。

【0017】そして、この低熱抵抗形SOP・IC21は樹脂を用いられてトランスファ成形法等により略長方形の平盤形状に一体成形された樹脂封止パッケージ20を備えており、この樹脂封止パッケージ20により前記タブ7、リード6のインナ部6ａ、放熱フィン8の一部、ペレット15、およびワイヤ18が非気密封止されている。すなわち、リード6のアウタ部6ｂ群は樹脂封止パッケージ20における両長辺側の側面からそれぞれ突出されており、放熱フィン8はそのアウタ部9が、樹脂封止パッケージ20の両長辺側の側面においてリード6のアウタ部6ｂ群列の中央部へ突出されている。そして、リード6のアウタ部6ｂは樹脂封止パッケージ20の外部において下方に屈曲され、さらに水平外方向に屈曲されて、ガル・ウイング形状に形成され、一対の放熱フィン8のそれぞれのアウタ部9は樹脂封止パッケージ20の外部において上方向に屈曲され、さらに水平内方向に屈曲されて、樹脂封止パッケージ20の上方において互いに隙間をもって平面視で重なるように配置されている。

【0018】以下、本発明に係る半導体装置の製造方法の一実施例である前記構成に係る低熱抵抗形SOP・ICの製造方法を説明する。この説明により、前記低熱抵抗形SOP・ICの構成はより一層明らかにされる。

【0019】本実施例に係る低熱抵抗形SOP・ICの製造方法においては、図2に示されているように構成されている多連リードフレーム1が製造される。

【0020】この多連リードフレーム1は燐青銅や無酸素銅等のような銅系（銅またはその合金）材料、または、コバールや42アロイ等のような鉄系材料からなる薄板が用いられて、打ち抜きプレス加工またはエッチング加工等のような適当な手段により一体成形されている。この多連リードフレーム1には複数の単位リードフレーム2が横方向に1列に並設されている。但し、多連リードフレーム1は1単位のみが図示されている。

【0021】単位リードフレーム2は位置決め孔3ａが開設されている外枠3を一対備えており、両外枠3、3は所定の間隔で平行一連にそれぞれ延設されている。各単位リードフレーム2において、両方の外枠3、3間には一対のダム部材5とその外側に一対のタイバー4とが互いに平行で、かつ、外枠と直角になるように配されて、一体的に吊持されている。ダム部材5には複数本のリード6が長手方向に等間隔に配されて、互いに平行で、ダム部材5と直交するように一体的に突設されている。各リード6の内側端部は先端を後記するタブの両方の長辺にそれぞれ近接されてこれを取り囲むように配されることとにより、インナ部6ａをそれぞれ構成している。他方、各リード6の外側延長部分は、その先端がタイバー4に一体的に接続され、アウタ部6ｂをそれぞれ構成している。そして、ダム部材5における隣り合うリード6、6間の部分は後述するパッケージ成形時にレジ

ンの流れをせき止めるダム５ａを実質的に構成している。

【００２２】また、両方のダム部材５、５には一対の放熱フィン８、８が長さ方向の中央部に配されて、ダム部材５、５と直交するようにそれぞれ一体的に突設されている。両放熱フィン８、８の内側端部間には、略長方形の板形状に形成されたタブ７が一体的に連結されて吊持されている。他方、両放熱フィン８、８の外側延長部分は、その先端がタイバー４よりも外側に延出しており、この部分はアウタ部９をそれぞれ実質的に構成するようになっている。

【００２３】両放熱フィン８、８の表裏面には凹凸面部１０が、ダム部材５に対してタブ寄りの端部において放熱フィンと直交する方向に横断するようにそれぞれ配されて、コイニング加工（圧印加工）またはエッチング加工等のような適当な手段により形成されている。

【００２４】さらに、両放熱フィン８、８の両端辺には一対１組のスリット１１が、ダム部材５に対してタブ寄りの端部にそれぞれ配されて、一体的に開設されている。両スリット１１、１１は互いに適当な間隔だけ離間されて平行に配設されており、後述する樹脂封止パッケージの成形工程においてレジンが確実に充填する大きさの矩形形状にそれぞれ形成されている。すなわち、このスリット１１により樹脂充填部１１Ａが実質的に構成されるようになっている。

【００２５】なお、タブ７はリード６群の面よりも後記するペレット厚み分程度、裏面方向に下げられている（所謂タブ下げ）。

【００２６】次に、前記のように構成された多連リードフレームには各単位リードフレーム毎にペレット・ボンディング作業、続いて、ワイヤ・ボンディング作業が実施され、これら作業により、図３に示されているような組立体が製造されることになる。これらのボンディング作業は多連リードフレームが横方向にピッチ送りされることにより、各単位リードフレーム毎に順次実施される。

【００２７】まず、ペレット・ボンディング作業により、半導体装置の製造工程における所謂前工程においてバイポーラ形の集積回路（図示せず）を作り込まれた半導体集積回路素子としてのペレット１５が、各単位リードフレーム２におけるタブ７上の略中央部に配されて、銀ペースト等のような適当なボンディング材料が用いられるペレットボンディング装置（図示せず）により形成されるボンディング層１４を介して固着される。

【００２８】そして、タブ７にボンディングされたペレット１５の電極パッド１６と、各単位リードフレーム２における各リード６のインナ部６ａとの間には、銅系、金系、または、アルミニウム系の材料を用いられて形成されているワイヤ１８が超音波熱圧着方式のようなワイヤボンディング装置（図示せず）が使用されることにより、その両端部をそれぞれボンディングされて橋絡される。

【００２９】すなわち、ペレット１５の上面における外周縁部には複数個の電極パッド１６が配されて形成されている。これら電極パッド１６は、ペレット１５のリード群側端辺にそれぞれ配されており、これら電極パッド１６は各リード６のインナ部６ａとの間にワイヤ１８をボンディングされて橋絡される。したがって、ペレット１５の集積回路における信号回路等は電極パッド１６、ワイヤ１８、リード６を介して電気的に外部に引き出されることになる。

【００３０】このようにしてペレットおよびワイヤ・ボンディングされた多連リードフレームには、各単位リードフレーム毎に樹脂封止するパッケージ群が、図４に示されているようなトランスファ成形装置を使用されて単位リードフレーム群について同時成形される。

【００３１】図４に示されているトランスファ成形装置はシリンダ装置等（図示せず）によって互いに型締めされる一対の上型３１と下型３２とを備えており、上型３１と下型３２との合わせ面には上型キャビティー凹部３３ａと、下型キャビティー凹部３３ｂとが互いに協働してキャビティー３３を形成するようにそれぞれ複数組設置されている。前記構成にかかる多連リードフレーム１が用いられて樹脂封止形パッケージがトランスファ成形される場合、上型３１および下型３２における各キャビティー３３は各単位リードフレーム２における一対のダム部材５、５間の空間にそれぞれ対応される。

【００３２】上型３１の合わせ面にはポット３４が開設されており、ポット３４にはシリンダ装置（図示せず）により進退されるプランジャ３５が成形材料としての樹脂（以下、レジンという。）を送給し得るように挿入されている。下型３２の合わせ面にはカル３６がポット３４との対向位置に配されて設置されているとともに、複数条のランナ３７がポット３４にそれぞれ接続するように放射状に配されて設置されている。各ランナ３７の他端部は下側キャビティー凹部３３ｂにそれぞれ接続されており、その接続部にはゲート３８がレジンをキャビティー３３内に注入し得るように形成されている。また、下型３２の合わせ面には逃げ凹所３９がリードフレームの厚みを逃げ得るように、多連リードフレーム１の外形よりも若干大きめの長方形で、その厚さと略等しい寸法の一定深さに没設されている。

【００３３】前記構成に係るトランスファ成形装置が使用される場合について、樹脂封止パッケージの成形方法を説明する。

【００３４】トランスファ成形時において、前記構成に係る多連リードフレーム１は下型３２に没設されている逃げ凹所３９内に、各単位リードフレーム２におけるペレット１５が各キャビティー３３内にそれぞれ収容されるように配されてセットされる。続いて、上型３１と下

型３２とが型締めされ、ポット３４からプランジャ３５によりレジン４０がランナ３７およびゲート３８を通じて各キャビティー３３に送給されて圧入される。

【００３５】注入後、レジンが熱硬化されて、樹脂封止パッケージ２０が成形されると、上型３１および下型３２は型開きされるとともに、エジェクタピン（図示せず）により樹脂封止パッケージ２０群が離型される。

【００３６】このようにして、図５および図６に示されているように、パッケージ２０群を成形された多連リードフレーム１はトランスファ成形装置３０から脱装される。そして、このように樹脂成形されたパッケージ２０の内部には、タブ７、放熱フィン８の一部、ベレット１５、リード６のインナ部６ａおよびワイヤ１８が樹脂封止されることになる。この状態において、各スリット１１内にはレジンが充填されることにより樹脂充填部１１Ａが実質的に形成されている。

【００３７】以上のようにして、樹脂封止パッケージを成形された多連リードフレームはめっき処理工程を経た後、または、経る前に、図７に示されているようにリードおよび放熱フィン切断成形工程において各単位リードフレーム毎に順次、図８に示されているリードおよび放熱フィン切断装置により、外枠３、タイバー４およびダムラａを切り離された後、図９に示されているリード成形装置により、リード６のアウタ部６ｂがガル・ウイング形状に屈曲成形され、また、図１１および図１２に示されている放熱フィン成形装置により、放熱フィン８のアウタ部９が所定形状に屈曲成形される。

【００３８】次に、図７～図１２を参照にしてリードおよび放熱フィン切断成形工程について説明する。

【００３９】このリードおよび放熱フィン切断成形工程で使用されるリードおよび放熱フィン切断成形装置５０は、図７に示されているようにフィーダ５１を備えており、フィーダ５１は間欠送り装置（図示せず）により、ワークとしての多連リードフレーム１を単位リードフレーム２に対応するピッチをもって一方向に歩進送りするように構成されている。フィーダ５１の一端部（以下、前端部とする。）にはローダ５２が設備されており、ローダ５２はラック等に収容された多連リードフレーム１をフィーダ５１上に１枚宛払い出すように構成されている。フィーダ５１の中間部にはリードおよび放熱フィン切断装置５３が設備されており、この装置は図８に示されているように構成されている。

【００４０】フィーダ５１におけるリードおよび放熱フィン切断装置５３の片脇には、図９に示されているように構成されているリード成形装置５４と、図１０～図１１に示されているように構成されている放熱フィン成形装置１００とが配されて設備されており、リードおよび放熱フィン切断装置５３とリード成形装置５４との間にはハンドラ５５が、リードおよび放熱フィン切断装置５３において多連リードフレーム１の外枠から切り離された中間製品としてのＩＣ部５７を保持してリード成形装置５４に移載し得るように設備されている。また、リード成形装置５４と放熱フィン成形装置１００との間にはフィーダ１０１が配設されている。

【００４１】フィーダ５１の後端部にはアンローダ５６が設備されており、このアンローダ５６はリードおよび放熱フィン切断装置５３においてＩＣ部５７を切り抜かれた多連リードフレーム１の残渣部品としての枠（フレーム）部５８をフィーダ５１から順次下して排出するように構成されている。

【００４２】図８に示されているリードおよび放熱フィン切断装置５３は上側取付板６０および下側取付板７０を備えており、上側取付板６０はシリンダ装置（図示せず）によって上下動されることにより、機台上に固設されている下側取付板７０に対して接近、離反するように構成されている。両取付板６０および７０にはホルダ６１および７１がそれぞれ固定的に取り付けられており、両ホルダ６１および７１には上側押さえ型６２および下側押さえ型７２（以下、上型６２および下型７２ということがある。）が互いに心合わせされてそれぞれ保持されている。上型６２および下型７２は互いにもなり合わせの状態になる略チャンネル型鋼形状にそれぞれ形成されており、上型６２と下型７２とは左右の押さえ部６３と７３とによって、リード６のアウタ部６ｂ、および、放熱フィン８のアウタ部９における根元部を上下から押さえるように構成されている。また、上型６２は後記する枠押さえと同様に、ガイド６８およびスプリング６９により独立懸架されるように構成されている。

【００４３】上側ホルダ６１には略くし歯形状（図示せず）に形成されたパンチ６４が一対、上型６２の左右両脇においてリード６群のピッチおよび放熱フィン８のアウタ部９の幅に対応するように配されて、垂直下向きに固設されており、パンチ６４には剪断刃６６がくし歯におけるエッジに配されて、後記する剪断ダイと協働して外枠３、タイバー４およびダムラａを切り落とすように構成されている。上側ホルダ６１には枠押さえ６７がガイド６８に摺動自在に嵌合されて上下動自在に支持されており、枠押さえ６７はスプリング６９により常時下方に付勢された状態で独立懸架されるように構成されている。このスプリング６９により、枠押さえ６７はリードフレームの外枠３およびタイバー４を後記する剪断ダイ上面との間で挟圧して押さえるようになっている。

【００４４】他方、下型７２には一対の剪断ダイ７６が押さえ部７３の左右両脇に配されて、リード形状の下面に沿う形状に形成されており、剪断ダイ７６は前記パンチ６４の剪断刃６６と協働して外枠３、タイバー４およびダムラａを切り落とすように形成されている。

【００４５】図９に示されているリード成形装置５４は上側取付板８０および下側取付板９０を備えており、上側取付板８０はシリンダ装置（図示せず）によって上下

動されることにより、機台上に固設されている下側取付板９０に対して接近、離反するように構成されている。両取付板８０および９０にはホルダ８１および９１がそれぞれ固定的に取り付けられており、両ホルダ８１および９１には上側押さえ型８２および下側押さえ型９２（以下、上型８２および下型９２ということがある。）が互いに心合わせされてそれぞれ保持されている。上型８２および下型９２は互いにもなか合わせの状態になる略チャンネル型鋼形状にそれぞれ形成されており、上型８２と下型９２とは左右の押さえ部８３ａ、８３ｂと、９３ａ、９３ｂとにより、リード６のアウタ部６ｂにおける根元部を上下から押さえるように構成されている。また、上型８２はガイド８８およびスプリング８９により独立懸架されるように構成されている。

【００４６】上側ホルダ８１には成形パンチ８４が一対、上型８２の左右両脇においてリード６群のピッチの幅に対応するように配されて、垂直下向きに固設されており、このパンチ８４は後記する成形ダイと協働してリード６のアウタ部６ｂをガル・ウイング形状に屈曲成形し得るように構成されている。パンチ８４のアウタ部６ｂに摺接する内側専部には琴曲面形状部８５が適当な曲率をもって形成されている。

【００４７】他方、下型９２には一対の成形ダイ９４が押さえ部９３の左右両脇に配されて、成形後における各リード６のアウタ部６ｂのガル・ウイング形状に倣う形状にそれぞれ形成されている。

【００４８】図１１および図１２に示されている放熱フィン成形装置１００は、上側押さえ型１１０と機台上に固設されている下側押さえ型１２０とが互いに心合わせされて配設されている。上側押さえ型１１０および下側押さえ型１２０とは左右の押さえ部１１０ａ、１１０ｂと、１２０ａ、１２０ｂとにより放熱フィン８のアウタ部９における根元部を上下から押さえるように構成されており、上側押さえ型１１０は図示されていないが、図９に示されているリード成形装置と同様に上下動可能に構成されている。

【００４９】図１１に示されているように、下側押さえ型１２０の両側には、それぞれ下側押さえ板１２１、１２２が上下動可能に設けられており、上側押さえ型１１０の両側で前記下側押さえ板１２１、１２２のさらに外側には、それぞれロール１１１、１１２が上下動可能に設けられている。これらのロール１１１、１１２は上下方向に移動することにより下側押さえ板１２１、１２２を基点として放熱フィン８のアウタ部９を直角に屈曲成形し得るように構成されている。

【００５０】また、図１２に示されているように、上側押さえ型１１０の両側には、前記一対のロール１１１、１１２とは別のロール１１３、１１４が上下動可能に設けられている。これらのロール１１３、１１４は上下方向に移動することより、前記一対のロール１１１、１１２によって屈曲成形された放熱フィン８のアウタ部９を、上側押さえ型１１０と下側押さえ型１２０の押さえ部を基点として、さらに直角に屈曲成形し得るように構成されている。なお、下側押さえ型１２０には、放熱フィン８のアウタ部９の屈曲成形部が挿入できるように、放熱フィン８のアウタ部９が配置する側の両面にそれぞれ窓孔１２３、１２４が形成されており、さらに前記屈曲成形部が配置できるように内側に空間１２５を備えている。

【００５１】次に、前記構成に係るリードおよび放熱フィン切断成形装置についての作用を説明する。

【００５２】前述したように、はんだめっき処理された、または、処理されない多連リードフレーム１は複数枚宛、ラック等に収容されてリードおよび放熱フィン切断成形装置５０のローダ５２に供給される。ローダ５２に送給された多連リードフレーム１はローダ５２によりラック等から１枚宛、フィーダ５１上に順次払い出されて行く。フィーダ５１に払い出された多連リードフレーム１はフィーダ５１により単位リードフレーム２、２間の間隔をもって１ピッチ短歩進送りされる。

【００５３】そして、フィーダ５１上を歩進送りされる多連リードフレーム１は単位リードフレーム２をリードおよび放熱フィン切断装置５３に順次供給されて行く。

【００５４】ここで、リードおよび放熱フィン切断装置についての作用を説明する。

【００５５】図８に示されているように、多連リードフレーム１についての歩進送りにより下型７２に単位リードフレーム２が四部にパッケージ２０を落とし込むようにしてセットされる。これにより、リード６および放熱フィン８のアウタ部６ｂおよび９における根本部が下型７２の押さえ部７３に当接する。

【００５６】次ぎに、シリング装置により上側取付板６０が下降されると、上型６２および枠押さえ６７が下型７２にスプリング６９の付勢力により合わせられる。これにより、上型６２の押さえ部６３と下型７２の押さえ部７３との間でリード６および放熱フィン８のアウタ部６ｂおよび９における根本部が挟圧されて固定される。また、枠押さえ６７と剪断ダイ７６上面との間で外枠３およびタイバー４が挟圧されて固定される。

【００５７】その後、上側取付板６０がさらに下降されて行くと、パンチ６４が下降されて行く。このとき、上型６２および枠押さえ６７はスプリング８９が圧縮変形されるため、下型７２および剪断ダイ７６に押圧される。パンチ６４の下降に伴って、パンチ６４の剪断刃７６と剪断ダイ７６との協働による剪断により外枠３、タイバー４およびダム５ａがリード６および放熱フィン８から切り離される。

【００５８】パンチ６４が所定のストロークを終了すると、パンチ６４は上側取付板６０により上昇され、元の待機状態まで戻される。

【００５９】リードおよび放熱フィン切断装置５３において、切断が終了し、上側取付板６０が上昇すると、多連リードフレーム１の外枠３から切り落とされた中間製品であるＩＣ部５７は、下型７２上からリード成形装置５４における下型９２上へハンドラ５５により移載される。

【００６０】ＩＣ部５７がリード成形装置５４に移載されると、フィーダ５１により多連リードフレーム１が単位リードフレーム２の１ピッチ分だけ歩進送りされ、次段の単位リードフレーム２について前記した切断作業が実施される。

【００６１】以降、多連リードフレーム１は各単位リードフレーム２について前述した切断作業が繰り返されて行く。

【００６２】そして、全ての単位リードフレーム２についての切断作業が終了した多連リードフレーム１の残滓としての枠（フレーム）部５８は、アンローダ５６においてフィーダ５１上から下ろされ所定の場所に回収される。

【００６３】一方、リード成形装置５４に供給されたＩＣ部５７は、このリード成形装置によりリード成形作業を実施される。

【００６４】次いで、リード成形装置５４についての作用を説明する。

【００６５】図９に示されているように、下型９２にＩＣ部５７が凹部にパッケージ２０を落とし込まれるようにしてセットされる。これにより、リード６のアウタ部６ｂにおける根元部が下型９２の押さえ部９３ｂ、９３ａにそれぞれ当接する。

【００６６】次ぎに、シリング装置により上側取付板８０が下降され、上型８２が下型９２にスプリング８９の付勢力により合わせられる。これにより、上型８２の押さえ部８３ａ、８３ｂと下型９２の押さえ部９３ａ、９３ｂとの間において、被屈曲部としてのリード６のアウタ部６ｂにおける根元部がそれぞれ挟圧されて固定される。

【００６７】その後、上側取付板８０がさらに下降されて行くと、パンチ８４が下降されて行く。このとき、上型８２はスプリング８９が圧縮変形されるため、下型８２に押圧される。

【００６８】さらに、パンチ８４が成形ダイ９４に対して下降されると、リード６はパンチ８４の下降に伴って成形ダイ９４に押しつけられることにより、この成形ダイ９４に倣うように屈曲されて所望のガル・ウイング形状に成形される。このようにしてガル・ウイング形状に形成されたリード６のアウタ部６ｂは、その下面（面付側主面）がパッケージ２０下面よりも極僅かに下方に突出するようになっている。

【００６９】パンチ８４が所定のストロークを終了すると、パンチ８４は上昇され、元の待機状態まで戻される。その後、成形済のＩＣ部１３０（図１０参照）は下型９２から取り外され、フィーダ１０１によって次工程が実施される放熱フィン成形装置１００に送給されて行く。

【００７０】フィーダ１０１によって放熱フィン成形装置１００に送られたＩＣ部１３０は、ここで放熱フィン８のアウタ部９が屈曲成形される。以下、放熱フィン成形装置１００についての作用を説明する。

【００７１】図１１に示されているように、前記の工程でリード６のアウタ部６ｂがガル・ウイング形状に屈曲成形された中間製品としてのＩＣ部１３０が、下側押さえ型１２０にセットされる。これにより、放熱フィン８のアウタ部９における根元部が下側押さえ型１２０の左右の押さえ部１２０ａ、１２０ｂにそれぞれ当接する。

【００７２】次に、上側押さえ型１１０が下降され、上側押さえ型１１０の押さえ部１１０ａ、１１０ｂと下側押さえ型１２０の押さえ部１２０ａ、１２０ｂとの間で、被屈曲部としての放熱フィン８のアウタ部９における根元部がそれぞれ挟圧されて固定される。

【００７３】その後、一対のロール１１１、１１２が下降されて行く。両ロール１１１、１１２が下降されると、放熱フィン８のアウタ部９はロール１１１、１１２の内側に配置した下側押さえ板１２１、１２２を基点として下方に直角にロール１１１、１１２によって屈曲成形される。

【００７４】この際、左右の下側押さえ板１２１、１２２における放熱フィン８のアウタ部９の根元部からの位置は、一方（左側）の下側押さえ板１２１の方が他方（右側）の下側押さえ板１２２よりも遠い距離位置に配置されているので、左右の放熱フィン８におけるそれぞれのアウタ部９の屈曲位置は相異しており、一方（左側）の放熱フィン８のアウタ部９は他方（右側）の放熱フィン８のアウタ部９よりも根元部から遠い位置で屈曲される。

【００７５】両ロール１１１、１１２による屈曲成形が終わると、左右の下側押さえ板１２１、１２２は下方の所定位置まで移動するとともに、左右のロール１１１、１１２は上方の所定位置まで移動して、次のＩＣ部の屈曲成形時まで待機する。

【００７６】その後、図１２に示されているように、前記ロール１１１、１１２とは別の一対のロール１１３、１１４が下降されて行く。これらのロール１１３、１１４が下降されると、放熱フィン８のアウタ部９は上側押さえ型１１０と下側押さえ型１２０の押さえ部を基点として下方に直角にロール１１３、１１４によって屈曲成形される。

【００７７】以上によって、一対の放熱フィン８のアウタ部９は、それぞれ根元部から屈曲されて、それぞれの屈曲成形部がＩＣ部１３０の樹脂封止パッケージ２０の上面（図１２では下側に配置している）を覆うようにし

て互いに隙間をあけて平面視で重なるように配置される。

【0078】以上のようにして、前記構成に係る低熱抵抗形ＳＯＰ・ＩＣ21が製造されたことになる。

【0079】前記構成に係る低熱抵抗形ＳＯＰ・ＩＣ21はプリント配線基板22において、図13および図13に示されているように表面実装されて使用される。

【0080】すなわち、プリント配線基板22上にはランド23が複数個、低熱抵抗形ＳＯＰ・ＩＣ21のリード6のアウタ部6b群に対応するように2列に配され、はんだ材料等を用いられて略長方形の小平板形状に形成されている。

【0081】低熱抵抗形ＳＯＰ・ＩＣ21がこのプリント配線基板22に表面実装される際には、このＳＯＰ・ＩＣ21のリード6のアウタ部6b群がプリント配線基板22上のランド23に、クリームはんだ材料（図示せず）を挟設されてそれぞれ当接される。続いて、リフローはんだ処理等のような適当な手段により、クリームはんだ材料が溶融された後、固化されると、リードのアウタ部6b群とランド23との間にははんだ付け部25が形成されるため、低熱抵抗形ＳＯＰ・ＩＣ21はプリント配線基板22に電気的かつ機械的に接続され、表面実装された状態になる。

【0082】前記実装状態において稼働中、ペレット15が発熱すると、ペレット15は放熱フィン8に一体となったタブ7に直接ボンディングされているため、熱は放熱フィン8に直接的に伝播され、その放熱フィン8を通じて効果的に放熱されることになる。

【0083】ここで、ペレット15から放熱フィン8に伝播された熱は、放熱フィン8のアウタ部9を通して外部空間へ放熱される。そして放熱フィン8のアウタ部9の放熱面積が大きいので、放熱性は良好であり、さらに、樹脂封止パッケージ20の上方において平面視で互いに重なるように配置する上下のアウタ部9、9間に隙間が設けられているので、樹脂封止パッケージ20の上方部のアウタ部9が空冷されることによって、さらに放熱性が向上する。

【0084】一方、放熱フィン8が大きい幅口をもって樹脂封止パッケージ20の外部に突出することにより、放熱フィン8と樹脂封止パッケージ20との界面が大きくなるため、その界面からの水分の浸入可能性が高まり、耐湿性が低下することが考えられる。

【0085】しかし、本実施例においては、放熱フィン8には樹脂封止パッケージ20の内部において凹凸面部10が放熱フィン8を横断するように形成されているため、耐湿性の低下は効果的に抑制されることになる。すなわち、凹凸面部10により放熱フィン8におけるペレット15までのリークパスが長くなるためである。

【0086】前記実施例によれば次の効果が得られる。

半導体装置の樹脂封止パッケージの側面から突出された複数個の放熱フィンのそれぞれのアウタ部が屈曲されて樹脂封止パッケージの上方において平面視で互いに重なるように配置されていることにより、放熱面積を大きくすることができるため、放熱性を良好にできる。

【0087】上記樹脂封止パッケージの上方において平面視で互いに重なるように配置するアウタ部の間に隙間が設けられていることにより、アウタ部が空冷されるため、放熱性をより一層良好にできる。

【0088】前記により、低熱抵抗形であって、しかも、外形の小さい半導体装置を得ることができる。

【0089】前記において、放熱フィンはタブに一体に形成され、別部品を取り付けないので、安価に製造することができる。

【0090】図14および図15は本発明の実施例2であるクワッド・フラット・樹脂封止パッケージ（ＱＦＰ）を備えている低熱抵抗形ＩＣを示すものであって、図14は放熱フィンが屈曲成形される前のＩＣ部130Aの平面図であり、図15はそのＩＣ部130Aにおける放熱フィン8Aのアウタ部9Aが屈曲成形されて形成されたＱＦＰ・ＩＣ21Aを示す正面図である。

【0091】本実施例2において、樹脂封止パッケージ20の4つの側面からはリードのアウタ部6bが複数本突出されており、樹脂封止パッケージ20の4つの角部からは4つの放熱フィン8Aのアウタ部9Aがそれぞれ対角線方向に突出されている。各放熱フィン8Aはタブ7の4つの角部に一体的に連設されており、それぞれの放熱フィン8Aのアウタ部9Aは細長い直線部190の先端に樹脂封止パッケージ20と同じ大きさをなす正方形部191を備えている。これらの正方形部191は直線部190と直角をなす直線に対して樹脂封止パッケージ20と対称形状をなすように形成されている。

【0092】そして、各放熱フィン8Aのアウタ部9Aはそれぞれ樹脂封止パッケージ20の上方部において互いに隙間をもって平面視で重なるように屈曲成形されている。したがって、このＱＦＰ・ＩＣ21Aは実装状態において稼働中に、タブ7上に固着されたペレットが発熱しても、その熱はタブ7から放熱フィン8Aに伝播され、樹脂封止パッケージ20の上方部に配置する放熱フィン8Aのアウタ部9Aから外部空間に良好に放熱される。

【0093】本実施例2に係るＱＦＰ・ＩＣ21Aは樹脂封止パッケージ20の上方において、前記実施例1と同様に、4つの放熱フィン8Aのアウタ9Aが平面視で互いに重なって配置されているので、放熱面積はきわめて大きくなり、したがって、放熱能力はきわめて大きくなる。

【0094】また、樹脂封止パッケージ20の上方において平面視で互いに重なるように配置されたアウタ部9Aの間には隙間が形成されているので、放熱部が空冷されることになり、放熱性はより一層向上する。

【００９５】また、樹脂封止パッケージ２０の上方に配置した放熱フィン８Ａのアウタ部９Ａの正方形部１９１が樹脂封止パッケージ２０と平面視において形が一致するように配置しているので、小形外形化を図れる。

【００９６】図１６および図１７は本発明の実施例３であるＳＯＰ・ＩＣを示すものであって、図１６は放熱フィンが屈曲成形される前のＩＣ部１３０Ｂを示す平面図、図１７（ａ）、（ｂ）はそのＩＣ部１３０Ｂにおける放熱フィン８Ｂのアウタ９Ｂが屈曲成形されて形成されたＳＯＰ・ＩＣ２１Ｂを示す正面図および側面図である。

【００９７】本実施例において、長方形状をなす樹脂封止パッケージ２０の長辺をなす両側面からは、リードのアウタ部６ｂが複数本突出されており、樹脂封止パッケージ２０の短辺をなす両側面からは放熱フィン８Ｂのアウタ部９Ｂがそれぞれ長手方向に突出されている。各放熱フィン８Ｂはタブ７にそれぞれ一体的に連設されており、それぞれの放熱フィン８Ｂのアウタ部９Ｂは幅狭部１９２に続いて樹脂封止パッケージ２０と同じ大きさをなす長方形部１９３を備えている。これらの長方形部１９３は樹脂封止パッケージ２０の短辺方向の直線に対して樹脂封止パッケージ２０と対称をなすように形成されている。

【００９８】そして、各放熱フィン８Ｂのアウタ部９Ｂはそれぞれ樹脂封止パッケージ２０の上方部において互いに隙間をもって平面視で重なるように屈曲成形されている。したがって、このＳＯＰ・ＩＣ２１Ｂについても、実装状態において稼働中に、タブ７上に固着されたペレットが発熱しても、その熱はタブ７から放熱フィン８Ｂに伝播され、樹脂封止パッケージ２０の上方部に配置する放熱フィン８Ｂのアウタ部９Ｂから外部空間に良好に放熱される。このＳＯＰ・ＩＣ２１Ｂも上記ＱＦＰ・ＩＣ２１Ａと同一の効果を発揮することになる。

【００９９】図１８および図１９は本発明の実施例４であるＱＦＰ・ＩＣを示すものであって、図１８は放熱フィンが屈曲成形される前のＩＣ部１３０Ｃを示す平面図、図１９はそのＩＣ部１３０Ｃにおける放熱フィン８Ｃのアウタ部９Ｃが屈曲成形されて形成されたＱＦＰ・ＩＣ２１Ｃを示す正面図である。

【０１００】本実施例４において、樹脂封止パッケージ２０の４つの側面からはリードのアウタ部６ｂが複数本突出しており、さらに、樹脂封止パッケージ２０の４つの側面からはそれぞれ放熱フィン８Ｃが突出形成されている。４つの放熱フィン８Ｃはタブ７の４つの角部にそれぞれ一体的に連設されている。放熱フィン８Ｃのアウタ部９Ｃは樹脂封止パッケージ２０の一側面において複数本のリードのアウタ部６ｂの両側位置においてリードのアウタ６ｂと平行にリードのアウタ部６ｂよりも外側に突出している一対の直線部１９４、１９５と、これらの直線部の先端部間に接続された長方形部１９６とから構成されており、直線部１９４、１９５と長方形部１９６で複数本のリードのアウタ６ｂを包囲するように設けられている。

【０１０１】そして、各放熱フィン８Ｃのアウタ部９Ｃはそれぞれ樹脂封止パッケージ２０の側方において、上方に屈曲されたのち、さらに、水平内方向に屈曲されて側面視で、略コ字形形状をなすように屈曲成形されている。これらの放熱フィン８Ｃのアウタ部９Ｃの上端面は樹脂封止パッケージ２０の上面と同一高さ位置をなすか、あるいは、樹脂封止パッケージ２０の上面より低い位置に配置されている。したがって、ＱＦＰ・ＩＣの全高が高くならないので、薄形を望む場合に適している。

【０１０２】以上本発明者によってなされた発明を実施例に基づき具体的に説明したが、本発明は前記実施例に限定されるものではなく、その要旨を逸脱しない範囲で種々変更可能であることはいうまでもない。

【０１０３】例えば、以上の説明では主として本発明者によってなされた発明をその背景となった利用分野である低熱抵抗形ＳＯＰ・ＩＣおよびＱＦＰ・ＩＣに適用した場合について説明したが、それに限定されるものではなく、スモール・アウトライン・Ｊリーッド・樹脂封止パッケージを備えている低熱抵抗形ＳＯＪ・ＩＣ、およびＱＦＪ（ＰＬＣＣ）・ＩＣ等にも適用することができる。

【０１０４】

【発明の効果】本願において開示される発明のうち代表的なものによって得られる効果を簡単に説明すれば、次の通りである。

【０１０５】樹脂封止パッケージの側面から突出された複数個の放熱フィンのそれぞれのアウタ部が屈曲されて樹脂封止パッケージの上方において平面視で互いに重なるように配置されていることにより、放熱面積を大きくできるため、小形で放熱能力の大きな半導体装置を得ることができる。

【図面の簡単な説明】

【図１】本発明の一実施例である低熱抵抗形半導体装置の実装状態を示す斜視図である。

【図２】低熱抵抗形半導体装置の製造方法に使用される多連リードフレーム示す一部省略平面図である。

【図３】ペレットおよびワイヤ・ボンディング工程後を示す一部省略平面図である。

【図４】樹脂封止パッケージの成形工程を示す一部省略正面断面図である。

【図５】樹脂封止パッケージの成形後を示す一部省略一部切断平面図である。

【図６】その一部省略一部切断正面図である。

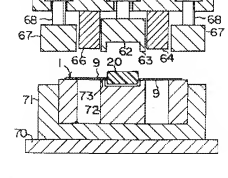
【図７】リードおよび放熱フィン切断成形装置を示す概略平面図である。

【図８】リードおよび放熱フィン切断装置を示す正面断面図である。

【図９】リード成形装置を示す正面断面図である。
【図１０】リード成形工程後を示す一部省略一部切断平面図である。
【図１１】放熱フィン成形装置を示す一部省略正面断面図で、（ａ）は第１段階の屈曲成形前を示し、（ｂ）は同屈曲成形後を示す。
【図１２】放熱フィン成形装置を示す一部省略正面断面図で、（ａ）は第２段階の屈曲成形前を示し、（ｂ）は同屈曲成形後を示す。
【図１３】低熱抵抗形半導体装置を示す一部切断正面図である。
【図１４】図１５に示す半導体装置の放熱フィンの屈曲成形前を示す平面図である。
【図１５】本発明の実施例２である半導体装置を示す正面図である。
【図１６】図１７に示す半導体装置の放熱フィンの屈曲成形前を示す平面図である。
【図１７】本発明の実施例３である半導体装置を示し、（ａ）は正面図、（ｂ）は側面図である。
【図１８】図１９に示す半導体装置の放熱フィンの屈曲成形前を示す平面図である。
【図１９】本発明の実施例４である半導体装置を示す正面図である。
【符号の説明】
１…多連リードフレーム、２…単位リードフレーム、３…外枠、４…タイバー、５…ダム部材、６…リード、６ａ…インナ部、６ｂ…アウタ部、７…タブ、８、８Ａ、８Ｂ、８Ｃ…放熱フィン、９、９Ａ、９Ｂ、９Ｃ…アウタ部、１０…凹凸面部、１１…スリット、１１Ａ…樹脂充填部、１４…ボンディング層、１５…ペレット、１６…電極パッド、１８…ワイヤ、２０…パッケージ、２１、２１Ｂ…低熱抵抗形ＳＯＰ・ＩＣ（半導体装置）、２１Ｃ…低熱抵抗形ＱＦＰ・ＩＣ（半導体装置）、２２…プリント配線基板、２３…ランド、２５…はんだ付け部、３０…トランスファ成形装置、３１…上型、３２…下型、３３…キャビティー、３３ａ…上型キャビティー凹部、３３ｂ…下型キャビティー凹部、３４…ポット、３５…プランジャ、３６…カル、３７…ランナ、３８…ゲート、３９…逃げ凹所、４０…レジン、５０…リードおよび放熱フィン切断成形装置、５１…フィーダ、５２…ローダ、５３…リードおよび放熱フィン切断装置、５４…リード成形装置、５５…ハンドラ、５６…アンローダ、５７…ＩＣ部、５８…枠（フレーム）部、６０、７０…取り付け板、６１、７１…ホルダ、６２、７２…押さえ型、６３、７３…押さえ部、６４…パンチ、６６…剪断刃、７６…剪断ダイ、６７…枠押さえ、６８…ガイド、６９…スプリング、８０、９０…取り付け板、８１、９１…ホルダ、８２、９２…押さえ型、８３ａ、８３ｂ、９３ａ、９３ｂ…押さえ部、８４…成形パンチ、９４…成形ダイ、８８…ガイド、８９…スプリング、１００…放熱フィン成形装置、１０１…フィーダ、１１０…上側押さえ型、１１０ａ、１１０ｂ…上側押さえ部、１１１、１１２、１１３、１１４…ロール、１２０…下側押さえ型、１２０ａ、１２０ｂ…下側押さえ部、１２１、１２２…下側押さえ板、１２３、１２４…窓孔、１２５…空間、１３０、１３０Ａ、１３０Ｂ、１３０Ｃ…ＩＣ部、１９０…直線部、１９１…正方形部、１９２…幅狭部、１９３…長方形部、１９４、１９５…直線部、１９６…長方形部。

【図１】

【図８】



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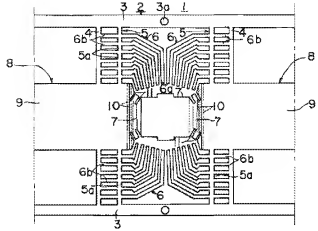

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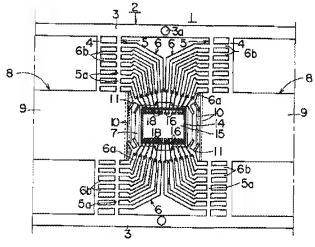

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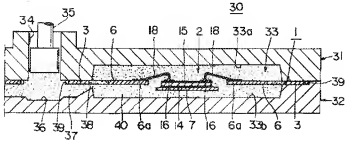

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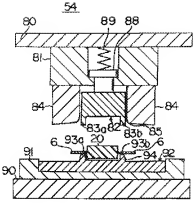

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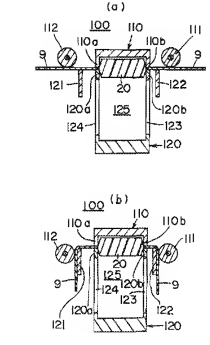

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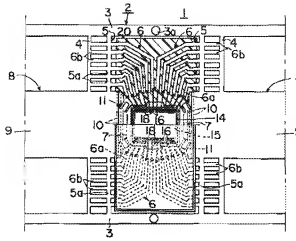

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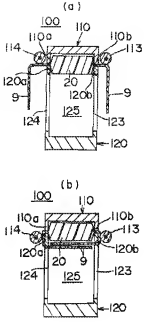

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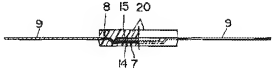

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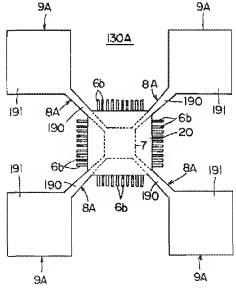

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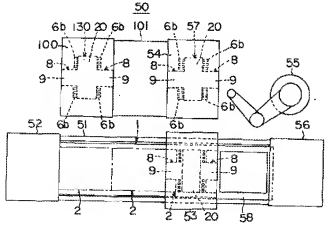

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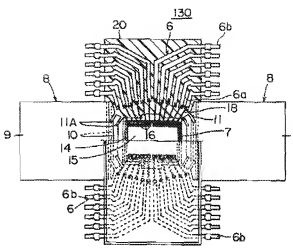

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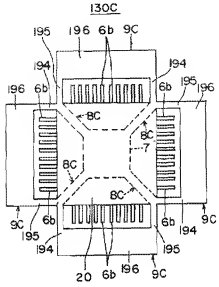

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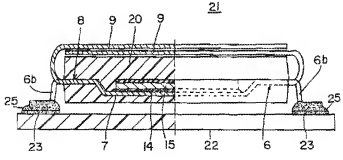

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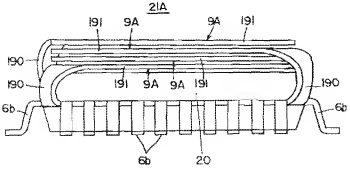

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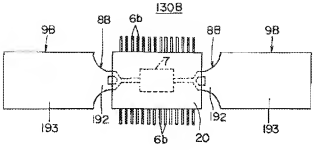

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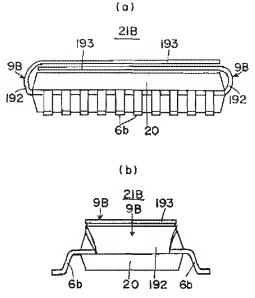

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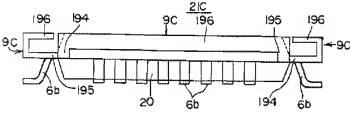

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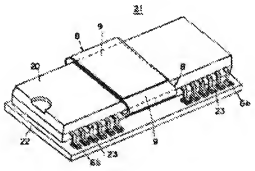
(54) SEMICONDUCTOR DEVICE, MANUFACTURE THEREOF, AND LEAD FRAME APPLIED THERETO

(57)Abstract:

PURPOSE: To obtain a semiconductor device small in size and large in heat dissipating capacity by a method wherein the outer sections of heat dissipating fins protruding from the side face of a resin-sealed package are bent and arranged so as to overlap each other in a top view.



CONSTITUTION: A tab 7 to which a semiconductor pellet 15 is bonded, leads 6 electrically connected to the semiconductor pellet 15, and heat dissipating fins 8 linked to the tab 7 are provided. A package 20 which seals up the tab 7, the pellet 15, and part of the leads 6 and the leads 6 with resin is provided. The outer parts 9 of the heat dissipating fins 8 extending from the side of the resin-sealed package 20 are bent and arranged so as to overlap each other in a top view above the resin-sealed package 20. By this setup, a semiconductor device of this design enhanced in heat dissipating area, small in size as a whole, and large in heat dissipating capacity can be obtained.